NetworkWorld

December 23/December 30, 1996 Volume 13, Number 52

POWER

The Most Powerful People

The Most Powerful Companies

The Power Struggles Shaping the Network Industry

The 1997 Power Players Issue

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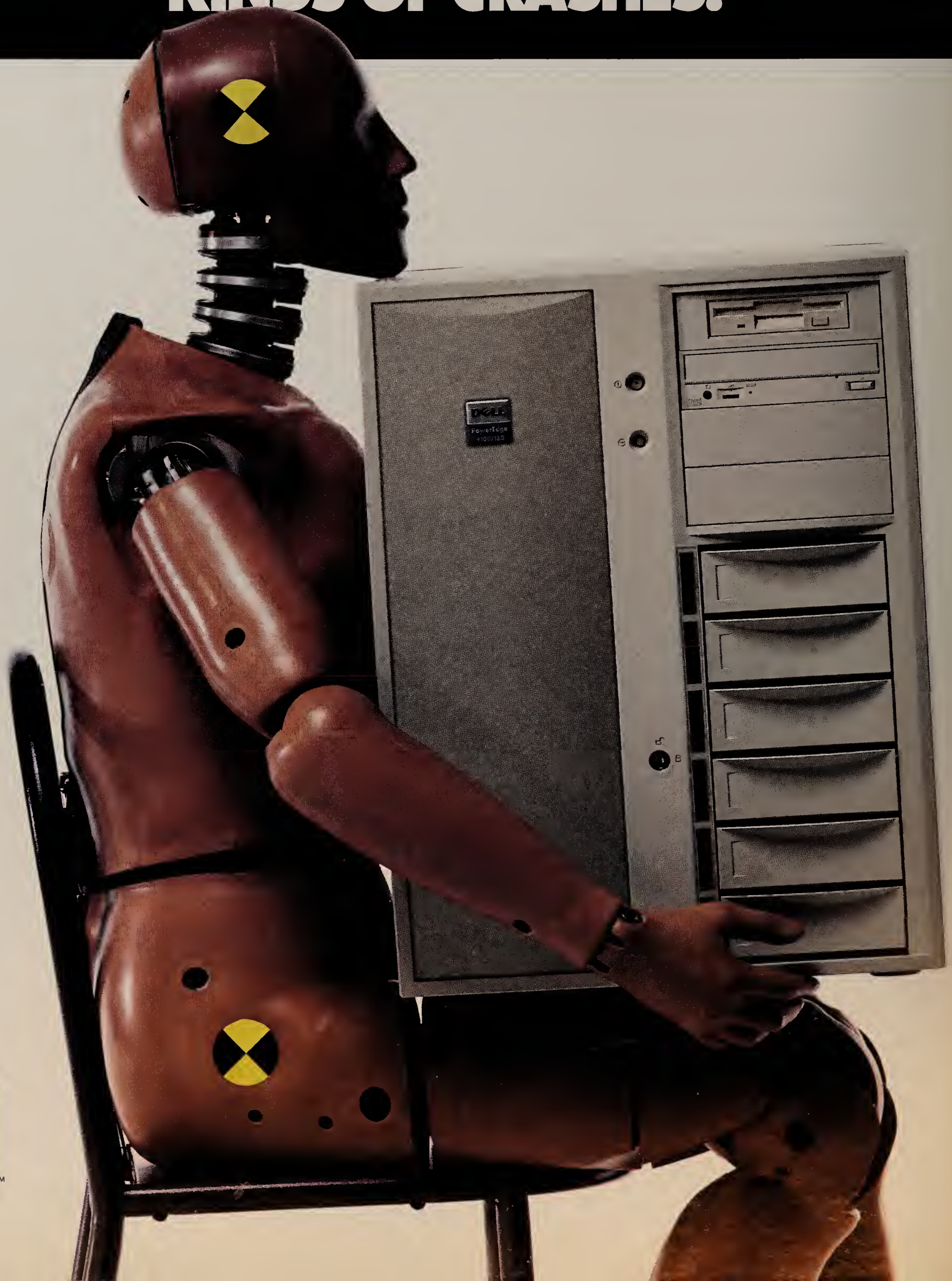

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- 64MB EDO ECC Memory (1GB Max.)
- Integrated SCSI-3 Controllers:
  -Ultra/Wide for Hard Drive
  -Ultra/Narrow for other peripherals
- 4GB Fast/Wide SCSI-2 Hard Drive (24GB Max. via Six 4GB Hot-Swap Drives)
- 8X SCSI CD-ROM Drive
- Intel Pro 100 PCI Ethernet Adapter
- Server Management System:
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- 3 Year Warranty including 1 Year NBD On-site Service
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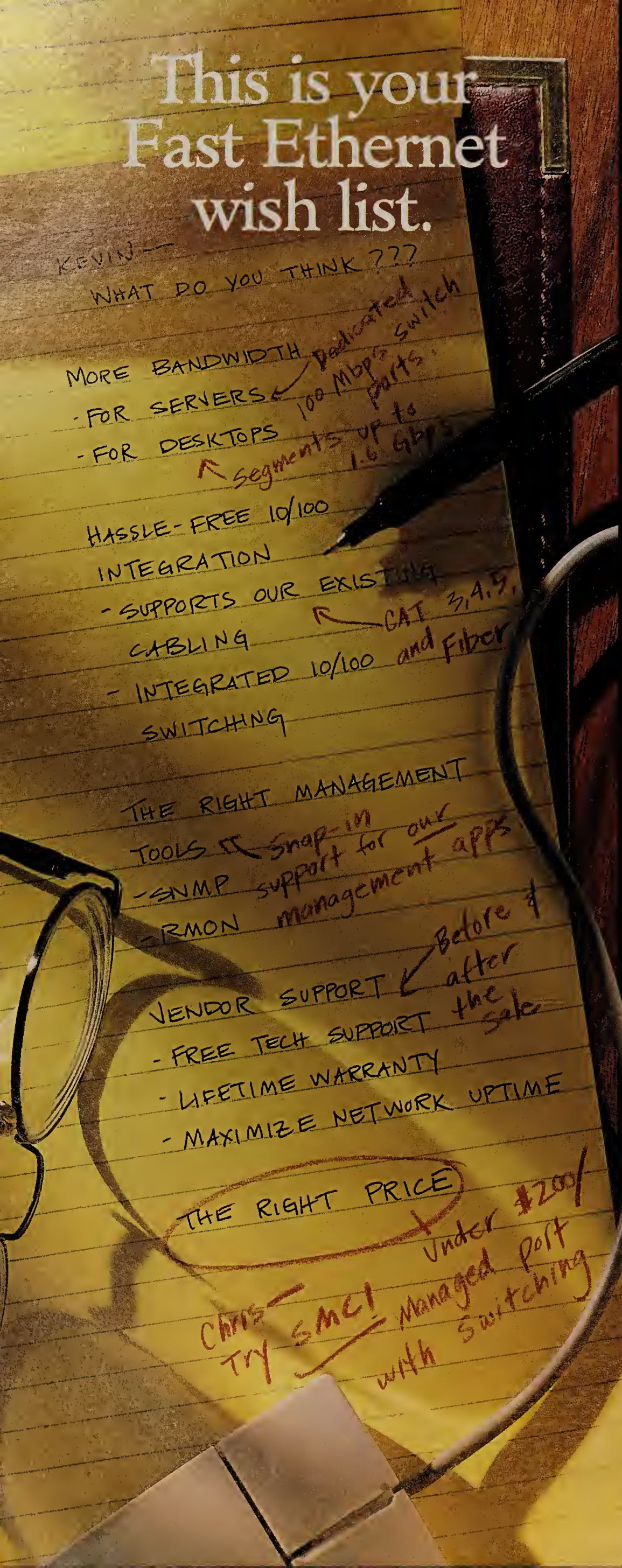

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POWER

A SPECIAL ISSUE OF NETWORK WORLD • AN IDG PUBLICATION

6 Network World 200: The Web's Tumultuous Arrival

What started out as a whimsical breeze built up to a Category Five IT hurricane that caught many of the Network World 200 napping. A look at how the industry's 200 largest companies fared the Web's arrival and other industry maelstroms.

21 The 10 Companies to Watch in '97

Hot start-ups like Marimba and Sanga will try to feed your Java addiction, while VocalTec and Precept will look to liven up the Internet with advanced audio and video. Find out who made our list of companies worth watching.

33 The 25 Most Powerful People in Networking

Who's in, who's out for 1997? Find out from our profiles of the people who control the network industry. Special Bonus: The **Power-O-Meter!** Readers rate the most powerful companies and CEOs.

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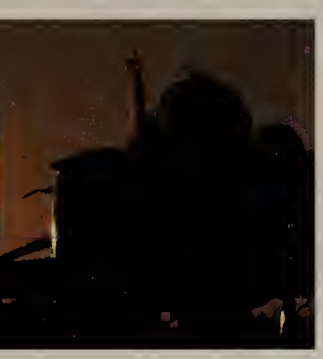
Our 1996 Technology Planning Survey says ATM will be big on campus while frame relay rules the WAN and intranets bloom all over.



The man behind ELVIS: Eli Lilly's John Swartzendruber.

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HOW TO CONTACT US

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From the Editor

More power to ya, baby

Welcome to the 1997 Power Players issue, the definitive guide to the people and companies that make the networked world go round.

With this, our third annual special issue, we continue to expand the exploration of power, that multifaceted, difficult-to-distill attribute that sets one person or company apart from so many others.

As expected, we offer the Network World 200 survey of the biggest networking companies — including our take on 10 companies to watch in 1997 — as well as our look at the 25 Most Powerful People in Networking and the 12th Annual User Excellence Awards, honoring the most innovative network managers. We also have our Technology Planning survey, spotlighting the technologies that will dominate corporate networks in the months and years to come.

But we've added a couple new items for your approval. Consider, if you will, our special feature on the power struggles whose outcomes will shape the network industry in 1997 and beyond: groupware vs. the Web; switching vs. routing; Microsoft vs. Netscape; network computers vs. PCs; and more.

Also, check out the Power-O-Meter — a graphical look at how readers rank the most powerful companies and executives in the network industry. Who's gaining power? Who's losing it? Take a swing at the Power-O-Meter to find out.

And for more on the Power-O-Meter and our other features, go online to Network World Fusion (www.nwfusion.com).

So here's to 1997. And here's hoping the new year finds you a more powerful player in your own region of the network world.

NetworkWorld Fusion

Grab an Excel version of our Network World 200 chart and follow links to more info about our 10 Companies to Watch.

Enter the number to the right in the DocFinder box on the home page.

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http://www.nwfusion.com

THE

What started ou
a Category Five
the Network Worl

By John Dix

It comes as no surprise that the fastest growing Network World 200 company in 1996 was Netscape Communications Corp. 1996, after all, was the year of the Web. The speed of its arrival forced key suppliers to rethink their strategies, fueled widespread industry growth and began to reorder IT thinking across the land.

So it is only fitting that Netscape, the company that popularized the Web, rode the crest of the wave. Analysts predict that, when the numbers are finalized, Netscape will post 1996 revenue of $318 million, up 295% from 1995.

Others should have fared so well. Collectively, revenues of the Network World 200 grew 12.5%, jumping from $555 billion in 1995 to an estimated $625 billion in 1996 (see chart to the right).

But like Netscape, many of the industry's preeminent players fared much better than that. 3Com Corp. was up 46%, Ascend Communications, Inc. 249%, Bay Networks, Inc. 50%, Cabletron Systems, Inc. 36%, Cisco Systems, Inc. 84%, Compaq Computer Corp. 29%, Hewlett-Packard Co. 23%, Intel Corp. 22%, MCI Communications Corp. 21%, Microsoft Corp. 46%, MFS Communications Company, Inc. 65%, PLATINUM Technologies, Inc. 56% and U.S. Robotics, Inc. 122%.

These are growth rates typically associated with small firms, but many companies in this list are multibillion-dollar giants, making the growth all the more remarkable. Cisco, for example, jumped from $2.2 billion in 1995 to $4.1 billion in 1996, mostly through acquisitions.

Even IBM is being heralded as a growth company. Under Chief Executive Officer Lou Gerstner, the company looks like it will close 1996 with revenue of $76 billion, up 6% — or $4 billion — from 1995. That is the equivalent of adding a Cisco.

While the Web can't be credited with driving the fortunes of all these top players, its significance can't be overlooked. That is perhaps best reflected in Microsoft's remarkable about-face.

Distracted in 1995 by the development of Windows 95, the then $6 billion software giant lost sight of what the market really cared about. It wasn't until December of that year that Microsoft Chairman Bill Gates woke up to the fact that corporate America saw the Web as a way to change business, while Windows 95 was merely a new PC operating system.

Said another way: CEOs were talking about the Web; they weren't talking about the next version of Windows.

By that point, according to some accounts, 20 million people were already using Netscape Navigator and other products to surf the Web. And SunSoft, Inc.'s Java language was gaining a steadfast following among developers.

"Gates & Co." were on the outside looking in. The one prominent thing they had to present to the cyberworld was a misconceived proprietary network designed to compete with America Online. Although that network effort has since been retooled to embrace Web standards, its heritage speaks volumes about Microsoft's thinking at the time.

Enter 1996. Netscape had blossomed into an $80 million company

The Network World 200

The Network World 200 shows who holds the real power in this supercharged $625 billion industry.

But besides providing financial data about the industry's 200 largest players, this $40,000 study includes information about how long the companies have been in business, what types of products and services they offer, contact information and the names of company principals.

The research was completed in late 1996 before many of the companies had a chance to compile their year-end figures, so the list is actually based on 1995 revenues. There is, however, 1996 data for 143 companies — a combination of data from firms whose years end early and projections for the rest from companies such as Investext, Dun & Bradstreet, Disclosure, Standard & Poor's, CorpTech and Wards.

Since we can not dig up 1996 revenue projections for every Network World 200 company, we generate the year-to-year industry growth figure — 12.5% this time around — by extrapolating from the 1995/1996 data we have for the 143 companies. (Note: AT&T figures were not used in this calculation because it is in the process of spinning off NCR and Lucent.)

WEB'S ARRIVAL

as a whimsical breeze built up to
T hurricane that caught many of
200 napping.

with a stock valuation of around $5 billion. By this time, Gates was frantically trying to retool Microsoft to make up for lost time. Projects were scraped, people redeployed and new divisions launched.

The scramble has begun to pay off, if not in a monetary sense, at least in terms of securing Microsoft a future in Web-driven computing. Even as Netscape was quadrupling its revenue this year, Microsoft managed to buy its way into the market by giving away serveral copies of its Internet Explorer browser software.

In fact, the Web has cost Microsoft more in lost opportunity than in actual growth. The company has managed just fine without a Web-driven cash infusion, thank you very much. Revenue jumped from $5.9 billion in 1995 to $8.7 billion in 1996.

While it is easy to see how the Web's arrival has affected Microsoft and a few other players, it is harder to gauge its overall effect on the industry. If you believe in the trickle-up theory of IT economics, the industry sluggishness of a year and a half ago may have been caused by the fact that Windows 95 did not boost sales of PCs and other goods as much as expected, a trend the Web reversed for many key players in 1996.

The need to provide employee access to intranets and to the Internet, the theory goes, drove the need for higher powered PCs, which created demand for fatter network pipes, bigger servers, more online data, faster databases, more powerful enterprise computing platforms and so on.

But certainly the Web wasn't the only industry force stirring up change in the network world in 1996. Other major forces at work included the continued migration to switched environments, but with less emphasis on ATM; telecom reform; the changing stakes in internetworking; and the stumbling of client/server computing.

Sector by sector

In the local network realm, perhaps the biggest story of the year was a non-story: ATM failed to catch on as predicted. In fact, it stumbled fairly badly. The standard has been drifting, and some components thereof, such as the Multi-Protocol over ATM (MPOA) specification, are so complicated that it has been hard for vendors to come to agreement on direction and implementation plans.

Although the standard was stabilized in April under the so-called Anchorage Accord (committees agreed to stop changing the specs for 18 to 24 months), the accord obsoleted the available bit rate (ABR) implementations of many vendors.

With MPOA and ABR in question, ATM loses much of its allure. Time will tell if the ATM community can get it together and save the movement. In the meantime, even stalwart ATM promoter FORE Systems, Inc. has taken to hedging its bets by buying into other high-speed LAN technologies, such as 100M bit/sec Ethernet.

HOT GROWTH COMPANIES

FASTEST GROWING COMPANIES FROM '95-'96

1995 Revenue Rank	Company	Worldwide Revenue ($M) 1995	1996 (Estimated)	%Δ '95-'96
172	Netscape Communications	81	318	295%
132	Ascend Communications	150	522	249%
93	America Online	384	1,094	185%
47	Bay Networks	1,400	2,100	185%
142	Cascade Communications	135	330	145%
156	FORE Systems	106	235	122%
55	U.S. Robotics	889	1,970	122%
92	Qualcomm	387	814	111%
163	McAfee	90	170	89%
35	Cisco Systems	2,230	4,100	84%
155	Pairgain Technologies	107	191	79%
149	Shiva	119	211	77%
170	Global Village Communication	86	144	68%
125	Teleport Communications Group	166	277	66%
64	LCI International	673	1,109	65%
74	MFS Communications	583	960	65%

FASTEST GROWING COMPANIES FROM '91-'96

1995 Revenue Rank	Company	Worldwide Revenues ($M) 1991	1996 (Estimated)	'91-'96 CAGR*
156	FORE Systems	0.1	235	372%
132	Ascend Communications	3.2	522	178%
155	Pairgain Technologies	2.0	191	149%
185	Hummingbird Communications	1.7	102	127%
93	America Online	30.0	1,094	105%
74	MFS Communications	37.2	960	92%
55	U.S. Robotics	78.7	1,970	90%
163	McAfee	7.0	170	89%
35	Cisco Systems	185.2	4,100	86%
144	Cheyenne Software	8.2	175	84%
28	Dell Computer	546.0	5,296	58%
40	EMC	260.0	2,275	54%
183	VTEL	11.0	90	52%
145	Xircom	26.3	193	49%
145	Aspect Telecommunications	44.0	292	46%

*CAGR = Compound annual growth rate

SPOT ILLUSTRATIONS: DAVE BLACK

EMPLOYEE FACTOR

THE 15 MOST PRODUCTIVE COMPANIES

1995 Revenue Rank	Company	Revenue/ employee 1995
9	Compaq Computer	$865,142
137	Centron	$856,287
42	Zenith Data Systems	$818,182
18	Apple Computer	$627,988
46	CompuCom Systems	$553,846
28	Dell Computer	$542,969
195	Olicom USA	$537,113
40	EMC	$495,870
132	Ascend Communications	$487,296
19	Nortel	$485,091
35	Cisco Systems	$474,468
185	Hummingbird Communications	$460,432
26	WorldCom	$455,000
47	Bay Networks	$451,904
31	Graybar Electric	$447,051

That strategy seems to have served FORE well: Revenue was up 122% in 1996 to $235 million.

ATM falling quiet proved opportunistic for the growth of 100M bit/sec Ethernet and the birth of Gigabit Ethernet. Although the latter is still on the drawing board, a few gigabit start-ups will likely show up on the Network World 200 radar screen next year, if only on "The Other 40" list.

Elsewhere on the LAN hardware front:

- Giant 3Com continued to roll, with revenue jumping 46% to $2.3 billion and profits growing 23% to $178 million.
- Cabletron joined the Billion Dollar Club by boosting revenue 36% to $1.1 billion.
- And LAN server king Compaq jumped 29% in revenue to $18.5 billion.

In news of note on the software front, Novell continued to grapple with a host of problems, not the least of which was executive turnover.

Chief Executive Officer Robert Frankenberg was ousted in the fall. The slew of other top execs that followed didn't seem to help much. The company is expected to post 1996 revenue of $1.4 billion, down 33% from 1995 levels. Profits are forecast at $126 million, 63% less than 1995. The company is now heavily promoting the intranet as its salvation.

Growthwise, long-term rival Banyan — which also changed its chief executive — did better than Novell. Banyan is expected to post revenue of $124 million for 1996, up 18% from the prior year. And there were profits: $2.2 million compared to a $21 million loss in 1995.

Telecom turmoil

If ATM was the principal letdown on the LAN side, telecom reform was the big disappointment in the wide area.

The so-called reform is perhaps best equated with the launch of a rocket. Lots of prep work up front, a huge explosion that sets things in motion and the silence of drifting in space.

End users have seen little to no benefit from the enactment of the telecommunications reform bill early in 1996, but there have been a slew of deals and mergers in anticipation of big things to come.

Pacific Telesis Group and SBC Communications kicked the deals off with the announcement of their $16.7 billion merger in April, followed closely by the proposed (and still pending) merger of NYNEX Corp. and Bell Atlantic Corp. The year wound down with a bang when WorldCom, Inc. scooped up competitive access provider MFS Communications (which had just acquired Internet service provider UUNET Technologies, Inc.), and MCI announced it would merge with British Telecommunications plc.

AT&T had already made its first big reform-minded move in late 1995 when it announced it would divest itself into three publicly traded companies: AT&T, the long-distance carrier; Lucent Technologies, Inc., a manufacturer of telecommunications equipment; and NCR Corp., a computer company. 1996 saw the company moving forward on all three fronts.

With that in the works, AT&T made its second big announcement right after the reform bill became law: Chairman Robert Allen announced that AT&T planned to charge into local markets in all 50 states.

While that makes for good headlines, the undertaking is enormous and the headway slow. As we approach the close of 1996, AT&T is still virtually unheard of on the local front.

Expect that to change in 1997, as AT&T, MCI, WorldCom and others start trotting out service packages that include local and long-distance components, and everything from virtual network offerings to Internet access.

One thing is for certain: 1996 will be the last year AT&T graces the top of the

INVESTING IN THE FUTURE

COMPANIES THAT SPENT THE MOST ON R&D IN 1996

1995 Revenue Rank	Company	1996 R&D*
102	PLATINUM Technology	37%
194	Apertus Technologies	26%
178	Tekelec	26%
97	BMC Software	24%
146	NetManage	24%
172	Netscape Communications	24%
23	Microsoft	23%
177	Emulex	22%
87	Symantec	21%
106	Borland International	21%
165	Boston Technology	21%
166	Telco Systems	20%
39	Novell	20%
92	Qualcomm	20%
59	Adobe Systems	19%

*As percentage of 1996 sales

MANAGING PROFITS

MOST PROFITABLE COMPANIES IN 1995

1995 Revenue Rank	Company	Profits as % of 1995 Revenue
185	Hummingbird Communications	32%
144	Cheyenne Software	30%
23	Microsoft	24%
58	Newbridge Networks	24%
97	BMC Software	22%
32	Computer Associates International	22%
7	Intel	22%
66	Pacific Telecom	22%
35	Cisco Systems	20%
132	Ascend Communications	20%
83	Adaptec	20%
57	Cabletron Systems	20%
142	Cascade Communications	19%
67	Tellabs	18%
139	Network General	18%
146	NetManage	18%

LARGEST INCREASE IN PROFITS '95-'96

1995 Revenue Rank	Company	%Δ'95-'96 CAGR*
1	AT&T	2,888%
155	Pairgain Technologies	2,776%
73	CompuServe	463%
132	Ascend Communications	289%
55	U.S. Robotics	239%
14	Sprint	218%
142	Cascade Communications	164%
173	Computer Network Technology	141%
8	MCI Communications	120%
114	Advanced Logic Research	116%
124	Cognos	112%
196	PC DOCS	91%
104	Pyramid Technology	88%
94	Telxon	83%
28	Dell Computer	83%

LARGEST INCREASE IN PROFITS '91-'96

1995 Revenue Rank	Company	%Δ'91-'96 CAGR*
156	FORE Systems	245%
142	Cascade Communications	132%
40	EMC	104%
49	Scientific-Atlanta	103%
67	Tellabs	89%
1	AT&T	89%
74	MFS Communications	81%
93	America Online	75%
28	Dell Computer	59%
95	Standard Microsystems	57%
35	Cisco Systems	57%
62	Informix Software	56%
9	Compaq Computer	54%
83	Adaptec	53%
57	Cabletron Systems	43%

*CAGR = Compound annual growth rate

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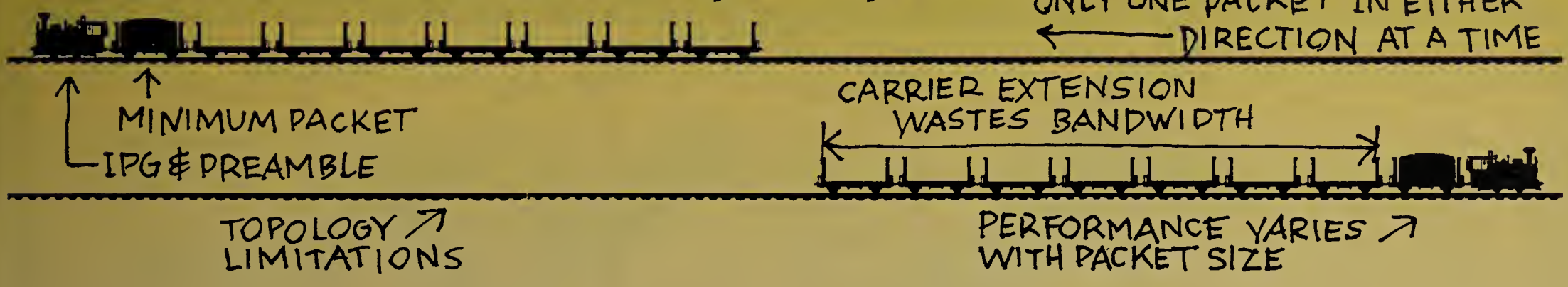
Half Duplex Repeaters



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PACKET ENGINES: THE LEADER IN GIGABIT ETHERNET

Half-duplex, traditional repeaters work but have limitations. Their throughput is limited and varies with packet sizes. Half-duplex repeaters also have limited distance coverage. The maximum link length is 100 meters (328 feet) for a network diameter of 200 meters (656 feet).

Full-duplex repeaters do not have these restrictions. Full-duplex repeaters have full performance at all packet sizes. They also do not have wasted throughput due to carrier extension. Placing the arbitration mechanism inside the repeater allows full-duplex repeaters to support link lengths up to 3 km for a network diameter of 6 km. Using different combinations of transmission technology, link lengths of 50, 100, 250 meters or 3 km may be created, all retaining full compliance with Ethernet.

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Network World 200 list. Come the end of 1997, AT&T will be something like a $40 billion company, probably No. 3 on the chart behind IBM and HP. But two other behemoths will be added to the list: Lucent and NCR, both multibillion-dollar companies in their own right.

Corporate internetworks

On the corporate internetwork front, the big news of the year was Cisco's acquisition of StrataCom, Inc. As the saying goes, this changes everything.

While Cisco has dominated the router business for years, and has come to dominate the LAN switch market by acquiring some of the most promising start-ups, the company has not been a player in big time-division multiplexing/cell relay backbone networks. Picking up StrataCom rounds out the company's portfolio nicely and does two things:

- Squarely positions the company as an end-to-end network provider, giving it even more ammunition for its continued assault on SNA data centers guarded by IBM.
- Gives it a well-received platform to pitch to carriers — traditional and ISPs alike — interested in venturing into everything from frame relay to ATM. Cisco views the carrier equipment market as being a major growth opportunity.

Both gains will make it harder for some of StrataCom's traditional competitors — such as Newbridge Networks, Inc., Network Equipment Technologies, Inc. (NET) and General DataComm, Inc. (GDC) — to keep pace in 1997. Nonetheless, all three of those companies fared well in 1996. Newbridge revenue was up 15% to $921 million, NET grew 19% to $431 million, and GDC inched up 4% to $117 million.

Cisco's more traditional competitor, Bay, suffered a few setbacks this year, including the changing of the guard at the top. President and CEO Andrew Ludwick stepped down and was replaced by David House, a longtime senior Intel executive. House also assumed Paul Severino's duties as chairman of the board; Severino continues on as a director.

House joined a fairly healthy Bay, which closed the books on 1996 in June with revenue up 50% to $2.1 billion and profits of $373 million, up from $131 million in 1995.

The softer side

An increasing portion of the traffic carried by Bay's boxes and those of the other internetwork vendors will be Web-related, probably at the expense of "traditional" client/server applications. So say users that have started to move toward Web computing, where browsers are used as universal front ends to a range of back-end applications.

Client/server was undermined by complexity. Every application needed a specific client, making updating and managing desktops a nightmare. But adoption of browsers as universal front ends requires new tools to bridge the gap between legacy resources and intranets.

Most of the major database vendors have promised such tools, as have a slew of start-ups.

ALPHABETICAL 200 COMPANY LISTING

1995 Revenue Rank	Company	1995 Revenue Rank	Company	1995 Revenue Rank	Company	1995 Revenue Rank	Company	1995 Revenue Rank	Company
43	3Com	181	Centigram Communications	141	FTP Software	146	NetManage	50	Siemens Rolm Communications
174	Accton Technology	137	Centron	147	Gandalf Technologies	201	Netrix	37	Silicon Graphics
83	Adaptec	184	Centura Software	169	GE American Communications	172	Netscape Communications	136	Software AG America
72	ADC Telecommunications	144	Cheyenne Software	109	General DataComm	239	NetSoft	14	Sprint
59	Adobe Systems	35	Cisco Systems	100	GENICOM	140	Network Computing Devices	95	Standard Microsystems
117	ADTRAN	189	CNet Technology	170	Global Village Communication	101	Network Equipment Technologies	71	Sterling Software
222	Advanced Computer Communications	124	Cognos	205	Graphnet	139	Network General	98	StrataCom
114	Advanced Logic Research	9	Compaq Computer	31	Graybar	204	Network Peripherals	24	Sun Microsystems
240	Alantec	151	Compression Labs	103	Group Technologies	116	Network Systems Group	52	Sybase
61	Alcatel Telecom	45	CompuCom Systems	5	GTE	193	Networth	87	Symantec
130	Allied Telesyn International	73	CompuServe	115	Hayes Microcomputer Products	58	Newbridge Networks	76	Symbol Technologies
93	America Online	32	Computer Associates Int'l	3	Hewlett-Packard	19	Nortel	227	Sync Research
68	American Management Systems	173	Computer Network Technology	54	Hughes Network Systems	39	Novell	202	Tally Printer
78	American Power Conversion	29	Computer Sciences	185	Hummingbird Communications	13	NYNEX	41	Tandem Computers
12	Ameritech	56	COMSAT	111	Hypercom	81	Octel Communications	178	Tekelec
25	AMP	134	Comverse Technology	2	IBM	195	Olicom USA	44	Tektronix
65	Andrew	107	Consolidated Communications	122	IDEA Associates	208	ON Technology	166	Telco Systems
36	Anixter	85	Control Data Systems	99	Infonet Services	153	Optical Data Systems	192	Telebit
194	Apertus Technologies	89	Cray Communications	105	Information Builders	30	Oracle	220	Telenex
18	Apple Computer	207	CrossComm	62	Informix Software	66	Pacific Telecom	125	Teleport Communications Group
229	Applied Voice Technology	186	Cubix	148	InteCom	20	Pacific Telesis Group	67	Tellabs
171	Artisoft	224	Cylink	212	Integrated Network	155	Pairgain Technologies	94	Telxon
187	Asante Technologies	233	D-Link Systems	7	Intel	196	PC DOCS	159	Tie Communications
132	Ascend Communications	48	Data General	168	Interleaf	190	Penril DataComm Networks	200	Tivoli Systems
113	Aspect Telecommunications	232	Data Race	237	Interlink Computer Science	96	PictureTel	210	Transaction Network Services
34	AST Research	162	Data Switch	203	Interphase	27	Pitney Bowes	188	Tricord Systems
1	AT&T	119	Datapoint	88	Intuit	238	PlainTree Systems	211	TyLink
91	Attachmate	218	Davox	223	Lantronix	102	PLATINUM Technology	55	U.S. Robotics
150	Auspex Systems	28	Dell Computer	213	Larscom	199	Procom Technology	235	UNIFY
157	Banyan Systems	231	Develcon Electronics	64	LCI International	118	Progress Software	22	Unisys
47	Bay Networks	123	Dialogic	120	Madge Networks (U.S.)	176	Proteon	17	US WEST
131	BBN Systems & Technologies	126	Digi International	180	MaxTech	216	PSINet	230	Verilink
86	Belden Wire & Cable	10	Digital Equipment	163	McAfee Associates	104	Pyramid Technology	183	VTEL
11	Bell Atlantic	209	Digital Link	8	MCI Communications	92	Qualcomm	154	Wall Data
6	BellSouth	129	Digital Microwave	182	Memotec Communications	179	Quarterdeck	206	Wandel & Goltermann
133	Best Power	46	DSC Communications	74	MFS Communications	69	Racal-Datacom	53	Wang Laboratories
60	BICC Cables	84	Dun & Bradstreet Software	167	Micom Communications	164	RAD Data Communications	138	Wavetek
97	BMC Software	80	Dynatech	161	Microcom	197	RAM Mobile Data	79	Williams Telecommunications (WilTel)
135	Boca Research	16	EDS	121	Microdyne	214	Remedy	26	WorldCom
128	Boole & Babbage	158	Eicon Technology	23	Microsoft	217	Retix	152	WRQ
106	Borland International	40	EMC	70	Mitel	112	Santa Cruz Operation	226	XcelleNet
165	Boston Technology	177	Emulex	108	Mobile Telecom. Technologies	75	SAP America	145	Xircom
236	BroadBand Technologies	219	Everex Systems	4	Motorola	15	SBC Communications	234	Xylan
225	Brooktrout Technology	90	Exide Electronics	215	MRV Communications	49	Scientific-Atlanta	198	Xylogics
63	Cable & Wireless	191	Farallon Computing	143	Multi-Tech Systems	21	Seagate Technology	127	Xyplex
57	Cabletron Systems	110	FileNet	33	National Semiconductor	228	Security Dynamics Technologies	42	Zenith Data Systems
82	California Microwave	156	FORE Systems	51	NEC America	77	Sequent Computer Systems	160	Zoom Telephonics
142	Cascade Communications	38	Frontier	175	NetFrame Systems	149	Shiva	221	ZyXel

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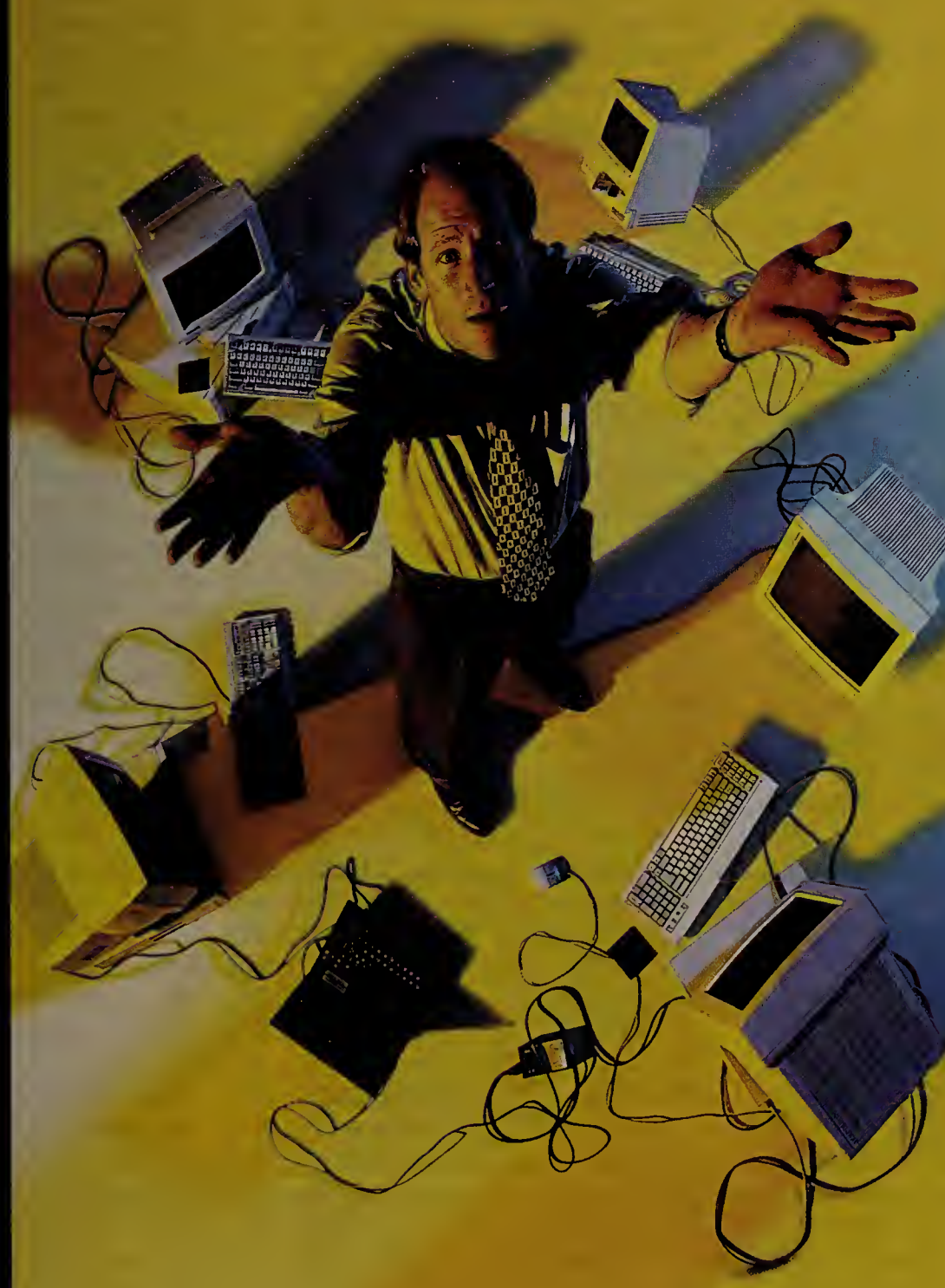

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1995 Revenue Rank	1994 Revenue Rank	Company	1995 Revenue $M	1995 Revenue % Int'l	1995 Profits $M	1995 Profits Profit Rank	1996 Estimated Revenue $M	1996 Estimated Revenue '95-'96 %Δ	1996 Estimated Revenue '91-'96 CAGR	1996 Estimated Profits $M	1996 Estimated Profits '95-'96 %Δ	1996 Estimated Profits '91-'96 CAGR	Number of Employees 1995	Number of Employees '95-'96 %Δ	Number of Employees '91-'96 CAGR	R&D % Rev. 1995	R&D % Rev. 1996	Pub/ Pri	Year Inc.	Fiscal Year Ends	Phone
1	1	AT&T	79,609	25%	139.0	35	38,946	-51%	-10%	4,153.0	2,888%	89%	299,300	-57%	-17%	4%		PU8	1885	12/31	(212) 387-5400
2	2	IBM	71,940		4,178.0	1	76,015	6%	3%	5,846.0	40%	NM	225,347	11%	-6%	6%	6%	PU8	1911	12/31	(919) 254-1128
3	3	Hewlett-Packard	31,519	56%	2,433.0	3	38,923	23%	22%	2,739.0	13%	29%	102,300			7%	7%	PU8	1939	10/31	(415) 857-1501
4	4	Motorola	27,000	63%	1,781.0	6	27,290	1%	20%	1,229.6	-31%	22%	142,000			8%	9%	PU8	1928	12/31	(847) 576-5000
5	5	GTE	19,957	13%	(2,144.0)	153	21,371	7%	2%	2,802.0	NM	13%	106,000					PU8	1935	12/31	(203) 965-2000
6	6	BellSouth	17,886	3%	(1,232.0)	151	18,850	5%	5%				87,571	-5%	-3%			PU8	1984	12/31	(404) 249-2000
7	14	Intel	16,200	51%	3,600.0	2	19,765	22%	33%	4,432.1	23%	40%	41,600	8%	13%	8%	9%	PU8	1968	12/31	(800) 628-8686
8	10	MCI Communications	15,265		548.0	13	18,520	21%	14%	1,204.0	120%	17%	50,367					PUB	1968	12/31	(202) 872-1600
9	16	Compaq Computer	14,755	51%	789.0	10	18,983	29%	42%	1,147.0	45%	54%	17,055			2%	2%	PUB	1982	12/31	(800) 345-1518
10	8	Digital Equipment	13,800		122.0	36	14,500	5%	1%	(112.0)	NM	-29%	61,700	-4%	-12%	7%	7%	PUB	1957	6/30	(508) 493-5111
11	7	Bell Atlantic	13,500		1,900.0	5	13,095	-3%	1%	1,874.3	-1%	9%	61,800	-1%	-4%			PUB	1984	12/31	(215) 963-6333
12	12	Ameritech	13,428		2,007.0	4	15,042	12%		2,078.4	4%		65,345					PUB	1983	12/31	(800) 257-0902
13	9	NYNEX	13,407		(1,850.0)	152	13,473	0%		1,512.2	NM							PUB	1984	12/31	(212) 370-7510
14	11	Sprint	12,795		395.3	20	14,021	10%	8%	1,256.8	218%	19%	48,000					PUB	1899	12/31	(913) 624-3000
15	13	SBC Communications	12,670		(930.0)	150							59,300					PU8	1983	12/31	(210) 821-4105
16		EDS	12,420	30%	938.9	9	14,676	18%	16%	1,034.4	10%	14%	92,000					PU8	1962	12/31	(972) 604-6000
17	19	US WEST	11,746		1,317.0	8	9,990	-15%		1,159.4	-12%		60,778					PUB	1984	12/31	(303) 793-6500
18	18	Apple Computer	11,062	48%	424.0	18	9,833	-11%	9%	(353.0)	NM	NM	17,615	-18%		6%	6%	PUB	1977	9/30	(408) 996-1010
19	20	Nortel	10,672		473.0	14	12,100	13%	8%	670.0	42%	6%	22,000			15%	14%	PUB	1895	12/31	(905) 863-6250
20	17	Pacific Telesis Group	9,042		(2,312.0)	154	9,325	3%		1,116.0	NM		49,000					PUB	1906	12/31	(415) 394-3000
21	26	Seagate Technology	7,256	42%	318.7	24	8,588	18%	26%	213.3	-33%	26%	76,543	16%	17%	5%	5%	PUB	1979	6/30	(408) 438-6550
22	21	Unisys	6,000	50%	(625.0)	148	6,268	4%	1%	79.8	NM	NM	37,000	-5%	-5%	7%	5%	PUB	1986	12/31	(215) 986-3290
23	23	Microsoft	5,937		1,453.0	7	8,671	46%	36%	2,195.0	51%	37%	19,641	2%	19%	14%	23%	PUB	1981	6/30	(206) 882-8080
24	22	Sun Microsystems	5,902	51%	355.8	21	7,095	20%	17%	476.4	34%	20%	14,498	20%	7%	10%	10%	PUB	1982	6/30	(415) 960-1300
25	24	AMP	5,227	57%	427.3	17	5,500	5%	10%	450.0	5%	9%	40,800	3%	7%	11%	11%	PUB	1956	12/31	(800) 835-7240
26	32	WorldCom	3,640		267.6	25	4,328	19%		391.4	46%		8,000					PUB	1987	12/31	(601) 360-8600
27	25	Pitney Bowes	3,555		407.7	19	3,859	9%	7%	468.5	15%	10%	23,136			2%	2%	PUB	1920	12/31	(203) 356-5000
28	27	Dell Computer	3,475		149.0	32	5,296	52%	58%	272.0	83%	59%	6,400	31%		2%	2%	PUB	1988	1/31	(800) 289-3355
29	28	Computer Sciences	3,372	21%	111.0	38	4,242	26%	33%	142.0	28%	17%	31,000	6%	4%			PU8	1959	3/31	(310) 615-0311
30	35	Oracle	2,967	58%	441.5	16	4,223	42%		603.2	37%					9%	9%	PUB	1977	5/31	(415) 506-7000
31	29	Graybar Electric	2,774		36.4	55	3,010	8%	12%	41.6	14%	34%	6,206	4%	6%			PUB	1925	12/31	(314) 512-9200
32	33	Computer Associates Int.	2,623	52%	586.0	12	3,505	34%	22%	752.0	28%	42%	7,550	17%	6%	9%	8%	PUB	1974	3/31	(516) 342-5224
33	31	National Semiconductor	2,379	57%	264.2	26	2,623	10%	9%	185.4	-30%	NM	22,400	-9%	-7%	12%	14%	PUB	1959	5/31	(408) 721-5000
34	30	AST Research	2,348		(240.0)	146	2,316	-1%		(336.0)	40%		6,595			2%	2%	PUB	1981	7/2	(714) 727-4141
35	40	Cisco Systems	2,230	42%	456.5	15	4,100	84%	86%	413.3	-9%	57%	4,700	76%	75%	9%	9%	PUB	1990	7/31	(408) 526-4000
36	37	Anixter	2,200	23%	39.4	27	2,450	11%	20%	36.0	-9%	NM	5,100	10%	12%			PU8	1957	12/31	(847) 677-2600
37		Silicon Graphics	2,200		224.9	52	2,900	32%		115.0	-49%					11%	12%	PU8	1982	6/30	(415) 960-1980
38	48	Frontier	2,144		217.5	28	2,500	17%	17%				7,837	8%	6%			PU8	1920	12/31	(716) 777-1000
39	36	Novell	2,041	47%	338.0	22	1,374	-33%	2%	125.9	-63%	-19%	7,800	-27%	-2%	18%	20%	PU8	1983	12/31	(801) 861-7000
40	38	EMC	1,921	36%	326.8	23	2,275	18%	54%	386.9	18%	104%	3,874			8%	7%	PU8	1979	12/31	(508) 435-1000
41	34	Tandem Computers	1,920		(107.5)	144	1,900	-1%	0%	(22.8)	-79%	NM	8,380	-5%	-7%	15%	15%	PU8	1974	9/30	(408) 285-6000
42	46	Zenith Data Systems	1,800										2,200					PRI	1979	12/31	(800) 553-0331
43	53	3Com	1,594	52%	145.0	33	2,327	46%	41%	178.0	23%	NM	4,048	28%	25%	10%	10%	PU8	1979	5/31	(408) 764-5000
44	39	Tektronix	1,498	48%	81.6	42	1,769	18%	6%	99.6	22%	25%	7,615	4%	-8%	11%	9%	PU8	1946	5/31	(503) 627-7111
45		CompuCom Systems	1,440		20.7	72	2,000	39%	30%				2,600	38%	27%			PU8	1989	12/31	(214) 265-3600
46	45	DSC Communications	1,422	20%	192.7	29	1,484	4%	26%	104.0	-46%	NM	5,860			13%	15%	PU8	1976	12/31	(800) 777-6804
47	43	Bay Networks	1,400		131.0	11	2,100	50%		373.0	185%		3,098	65%		10%	10%	PU8	1994	6/30	(408) 988-2400
48	42	Data General	1,200	43%	(46.7)	138	1,300	8%	2%	28.1	NM	-20%	5,030	-3%	-11%	7%	8%	PU8	1968	9/28	(508) 898-5000
49	56	Scientific-Atlanta	1,147		63.5	47	1,048	-9%	16%	36.6	-42%	103%						PU8	1951	6/30	(770) 903-5000
50	50	Siemens Rolm Comm.	1,000										5,700					PU8	1989	9/30	(800) 727-6140
51	47	NEC America	991										2,400					PUB	1963	3/31	(516) 753-7000
52	55	Sybase	957		(19.5)	131	1,013	6%	43%	(20.7)	6%	NM	5,865			16%	17%	PU8	1984	12/31	(510) 922-3500
53	52	Wang Laboratories	946		(61.3)	143	1,090	15%	-12%	(0.6)	-99%	-73%	6,900	14%				PU8	1955	6/30	(800) 225-0654
54	64	Hughes Network Systems	906										3,000					PU8	1971	12/31	(301) 428-5500
55	67	U.S. Robotics	889	26%	66.0	46	1,970	122%	90%	224.0	239%	25%	3,000	100%	80%	6%	6%	PU8	1976	9/30	(847) 982-5010
56	54	COMSAT	852		37.8	54							2,991					PU8	1961	12/31	(301) 214-3000
57	59	Cabletron Systems	811	29%	162.0	31	1,100	36%	43%	216.7	34%	43%	4,638	29%	33%	10%	10%	PU8	1983	2/28	(603) 332-9400
58	63	Newbridge Networks	801	42%	188.4	30	921	15%	44%	202.9	8%	NM	2,955	15%	24%	13%	14%	PU8	1986	4/30	(703) 834-3600
59	60	Adobe Systems	762		93.4	40	838	10%	30%	139.2	49%	22%				18%	19%	PU8	1982	11/30	(408) 536-6000
60	66	BICC Cables	750										3,500					PU8	1984	12/31	(914) 353-4000
61	96	Alcatel Telecom	750										4,100					PU8	1991	12/31	(800) 252-2835
62	71	Informix Software	709		105.3	39	980	38%	40%	115.4	10%	56%			13%	11%	12%	PU8	1980	12/31	(415) 926-6300
63	58	Cable & Wireless	680				736	8%		76.0			2,400	4%				PU8	1975	3/31	(703) 790-5300
64	72	LCI International	673		50.8	50	1,109	65%	37%				1,624	35%	22%			PU8	1983	12/31	(800) 296-0220
65	61	Andrew	664	45%	70.0	44	794	20%	14%	88.9	27%	32%	3,345	22%	4%	4%		PU8	1937	9/30	(708) 349-5661
66	57	Pacific Telecom	649		139.5	34							2,762					PU8	1955	12/31	(360) 905-5800
67	69	Telkabs	635	37%	115.6	37	828	30%	31%	160.3	39%	89%	2,808			13%	12%	PU8	1975	12/31	(630) 378-8800

1995 Revenue Rank	Chair	CEO	President	Sales	Products and Services	Notes
1	Robert E. Allen	Robert E. Allen			Long-distance telecom, computer and network products and services	
2	Louis Gerstner Jr.	Louis Gerstner Jr.	Louis Gerstner Jr.	Robert LaBant	Computer and network products and services	
3	Lewis E. Platt	Lewis E. Platt	Lewis E. Platt		Products and services for measurement, computing, communications	
4	William Weisz	Gary Tooker	Christopher Galvin		Wireless, semiconductors, cellular phones, 2-way radio	
5	Charles R. Lee	Charles R. Lee	Kent B. Foster		Telecommunications	
6	John L. Clendenin	John L. Clendenin	F. Duane Ackerman	Charles B. Coe	Local telecom, long-distance access, wireless	
7	Gordon E. Moore	Andrew S. Grove	Andrew S. Grove	Paul S. Otellini	Semiconductors, PC, network, communications products	
8	Bert C. Roberts Jr.	Bert C. Roberts Jr.	Timothy F. Price		Long-distance, global telecom and information services	Merger w/British Telecom (10/96)
9	Ben Rosen	Eckhard Pfeiffer	Eckhard Pfeiffer	Ross Cooley	Servers, desktops, networking products, home PCs, notebooks	
10	Robert B. Palmer	Robert B. Palmer	Robert B. Palmer		Computer and network products and services	
11	Raymond W. Smith				Telecommunications, wireless, information services	Merger w/NYNEX in process (4/96)
12	Richard C. Notebaert	Richard C. Notebaert		Andrew Patti	Local/long-distance telecom, video communication, online services	
13	Ivan G. Seidenberg	Ivan G. Seidenberg	Richard W. Blackburn		Local/long-distance, global telecom & information services	Merger w/Bell Atlantic in process (4/96)
14	William T. Esrey	William T. Esrey	Ronald T. LeMay		Global voice, data and video services and related products	
15	Edward E. Whitacre Jr.	Edward E. Whitacre Jr.	James R. Adams		Local/long-distance, cellular telephone services	
16	Les Alberthal	Les Alberthal	Jeff Heller	Gail Rigler	Information services	
17	Richard D. McCormick	Richard D. McCormick	Richard D. McCormick		Telecommunications	
18	Gilbert Amelio	Gilbert Amelio		John Floisand	Personal systems, software, servers, communications	
19	Donald J. Schuenke	Jean C. Monty	Jean C. Monty	John A. Roth	Switching, business communications systems	Canadian company
20	Philip J. Quigley	Philip J. Quigley	Philip J. Quigley		High-speed digital transmission, voice mail, network access	Subsid'y of SBC Communications (8/96)
21	Alan F. Shugart	Alan F. Shugart	Alan F. Shugart	Bernie Carballo	Disk/tape drives, storage/network/information mgmt. software	
22	James Unruh	James Unruh	Alan Lutz	Dewaine L. Osman	Computers, information services and systems integration	
23	William H. Gates	William H. Gates		Steve Ballmer	PC operating systems, office suites, PC applications	
24	Scott G. McNealy	Scott G. McNealy	Scott G. McNealy	Joe Roebuck	Enterprise network computing hardware, software and services	
25	James E. Marley	William J. Hudson	William J. Hudson		Cabling, LAN interconnect systems	
26		Bernard J. Ebbers	Bernard J. Ebbers		Long-distance telephone services	Subsid'y of MFS Communications (8/96)
27	Michael J. Critelli	Michael J. Critelli	Marc C. Breslawsky		Mailing systems/software, on-site management services	
28	Michael S. Dell	Michael S. Dell		Morton L. Topfer	Personal computers and peripherals	
29	William R. Hoover	Van B. Honeycutt	Van B. Honeycutt	Larry Parkus	Management consulting, systems integration, outsourcing	
30	Lawrence J. Ellison	Lawrence J. Ellison			Database software, information management services	
31		Carl L. Hall	Carl L. Hall	R.A. Reynolds	Communications products	
32	Charles B. Wang	Charles B. Wang	Sanjay Kumar	Richard Chiarello	Mainframe, client/server software, systems mgmt., bus. applications	
33	Brian L. Halla	Brian L. Halla	Brian L. Halla	Patrick J. Brockett	Analog/digital mixed signal chips, video technology, data compression	
34	Safi Qureshey	Safi Qureshey	Safi Qureshey		PC portables to superservers	
35	John Morgridge	John Chambers	John Chambers	Gary Daichendt	Routers, LAN/WAN/ATM switches, management software	
36	Rod F. Dammeyer	Robert W. Grubbs	Robert W. Grubbs	Sherwood Robins	Cabling/network systems for data/voice/video applications	Subsidiary of Anixter International
37	Ed McCracken	Ed McCracken		Gary Lauer	Servers, workstations, supercomputers, semiconductors	
38	Ronald L. Bittner	Ronald L. Bittner	Kevin J. Bennis	James E. Whelehan	Local/long-distance telecom services, audio/video conferencing	
39	John Young		Joseph Marengi	Ron Heinz	Network operating systems, applications, distributed services	
40	Richard J. Egan	Michael C. Ruettgers	Michael C. Ruettgers	Michael A. Klayko	Storage mgmt. systems, data migration, backup facilities	
41	Thomas J. Perkins	Roel Pieper	Enrico Pesatori	John Losier	High-availability computers, transaction process monitors	
42			Jacques Noels	Clifford Jenks	PCs, subnotebooks, portable computers, monitors, file servers	Subsidiary of Packard Bell (4/96)
43	Eric Benhamou	Eric Benhamou			Data network equipment, internetworking/remote access	
44	Jerome J. Meyer	Jerome J. Meyer	Jerome J. Meyer	Robert Dunne	Measurement, color printing, imaging, video, networking	
45	Charles A. Root	Edward R. Anderson	Edward R. Anderson	Dan Brown	Network/PC integration, management, support, procurement	
46	James L. Donald	James L. Donald	James L. Donald	Charles Ansley	Switching, transmission, access, network mgmt. systems	
47	Paul Severino	Andrew Ludwick	Andrew Ludwick	Gary Rogers	Network management, LAN support products	
48		Ronald L. Skates	Ronald L. Skates	Joel Schwartz	Servers, storage systems and related software/services	
49	Sid Topol	James McDonald	James McDonald		Broadband telecom, satellite-based video/voice/data networks	
50	Karl Geng	Karl Geng	Karl Geng	Richard Allocco	PBX voice mail systems	Subsidiary of Siemens Nixdorf AG (Ger.)*
51		Mineo Sugiyama	Mineo Sugiyama		ATM, PBXs, fiber, wireless, video, satellite systems	Subsidiary of Packard Bell (6/96)
52		Mitchell Kertzman	Mitchell Kertzman	Mike Forster	Databases, middleware, transaction processing, data warehousing	
53	Joseph M. Tucci	Joseph M. Tucci	Donald P. Casey	Steve Quehl	Imaging software, network integration	
54	Jack Shaw	Jack Shaw	Pradman Kaul	Sheldon Revkin	VSAT, cellular/voice/data, LAN/WAN internetworking, frame relay, ATM	Unit of Hughes Electronics
55	Casey Cowell	Casey Cowell	Casey Cowell		Remote access, LAN switching, modems, ISDN, terminal adapters	
56		Bruce L. Crockett	Bruce L. Crockett		Satellite, wireless audio, video/data communications	
57	Craig Benson	S. Robert Levine	S. Robert Levine	Kenneth Levine	Ethernet, token ring, FDDI, ATM/remote access	
58	Terence Matthews	Terance Matthews	Peter Sommerer	F. Michael Pascoe	WAN, ATM, routing, frame relay, multiplexers, network management	Canadian company
59	John Warnock	John Warnock	Charles Geschke	Dave Pratt	Graphics/layout, multimedia, Internet publishing, consumer products	
60	Carl Painter	Carl Painter			Telephone/transmission/power cables	Subsidiary of BICC PIC (GB)*
61		David E. Orr	David E. Orr	Larry N. Hulbert	Voice, data, video and multimedia telecommunications products	Subsidiary of Alcatel Alsthom (Fr)*
62	Phillip White	Phillip White	Phillip White	Ron Alverez	DBMSs, tools and connectivity	
63	Gabriel A. Battista	Gabriel A. Battista	Alan Peyser	Bill Coine	Software, data communications	Subsidiary of Cable & Wireless Plc (GB)*
64	H. Brian Thompson	H. Brian Thompson	Thomas J. Wynne	Marshall Hanno	Local/long-distance telecom, Internet access, network management	
65	Floyd L. English	Floyd L. English	Floyd L. English		Coaxial cable, microwave, wireless	
66	Charles E. Robinson	Charles E. Robinson	Charles E. Robinson		Local/long-distance, wireless telecom	
67		Michael J. Birck		C. Chris Cooney	Digital cross-connect systems, network access systems	

1995 Revenue Rank	1994 Revenue Rank	Company	1995 Revenue $M	1995 Revenue % Int'l	1995 Profits $M	1995 Profits Profit Rank	1996 Estimated Revenue $M	1996 Estimated Revenue '95-'96 %Δ	1996 Estimated Revenue '91-'96 CAGR	1996 Estimated Profits $M	1996 Estimated Profits '95-'96 %Δ	1996 Estimated Profits '91-'96 CAGR	Number of Employees 1995	Number of Employees '95-'96 %Δ	Number of Employees '91-'96 CAGR	R&D % Rev. 1995	R&D % Rev. 1996	Pub/ Prl	Year Inc.	Fiscal Year Ends	Phone
68	78	American Management	632	22%	29.2	62	790	25%	23%				5,750	13%	15%			PU8	1979	12/31	(703) 267-5000
69	62	Racal-Datacom	626		23.3	70	657	5%		32.4	39%		4,129	14%		7%	7%	PU8	1950	3/31	(954) 846-1601
70	68	Mitel	589	48%	32.0	58	576	-2%	6%	51.0	59%	NM	3,561	9%	0%	8%	8%	PU8	1971	3/31	(613) 592-2122
71	70	Sterling Software	588	29%									3,700			11%		PU8	1983	9/30	(214) 891-8600
72	75	ADC Telecommunications	586	18%	55.2	48	800	37%	22%	80.0	45%	29%	2,984	34%	10%	11%	11%	PU8	1953	10/31	(612) 938-8080
73	76	CompuServe	583	2%	8.7	147	793	36%		49.0	463%							PU8	1969	4/30	(614) 723-1070
74	91	MFS Communications	583		(267.9)	94	960	65%	92%	(547.8)	104%	81%	3,201	28%				PU8	1988	12/31	(402) 231-3000
75	123	SAP America	564										1,267					PUB	1988	12/31	(610) 725-4500
76		Symbol Technologies	555	40%	46.5	51	650	17%					2,800	7%		10%	10%	PU8	1973	12/31	(516) 738-2400
77		Sequent Computer Sys.	540		35.0	56	616	14%	24%	20.4	-42%	NM	1,900	16%		8%	8%	PU8	1983	12/30	(800) 257-9044
78	81	American Power Conversion	515		69.5	45	651	26%		68.0	-2%		2,400			3%	3%	PU8	1981	12/31	(401) 789-5735
79		WilTel	495		28.3	63	559	13%	22%	21.6	-24%	26%	2,605	31%	18%			PU8	1991	12/31	(713) 307-4000
80	74	Dynatech	488	21%	19.2	76	475	-3%	2%	14.2	-26%	-2%				6%	8%	PU8	1985	3/31	(703) 494-1400
81	78	Octel Communications	473	25%	31.1	59	564	19%	29%	50.7	63%	23%	2,744	6%	21%	15%	14%	PU8	1982	6/30	(408) 321-2000
82	83	California Microwave	468	48%	(7.9)	126	461	-1%	19%	11.6	NM	7%	2,382	-4%	14%	6%	7%	PU8	1968	6/30	(415) 596-9000
83	82	Adaptec	466		93.4	41	659	41%	39%	103.0	10%	53%	1,900	32%	23%	13%	13%	PUB	1981	3/31	(408) 945-8600
84	88	Dun & Bradstreet Software	457										3,700					PU8	1990	12/31	(404) 239-2000
85	65	Control Data Systems	455	62%	8.3	95							1,829			2%		PU8	1992	12/31	(612) 415-4859
86	80	Belden Wire & Cable	440										2,700					PU8	1993	12/31	(800) 235-3361
87	87	Symantec	431	30%	33.4	57	445	3%	31%	(39.8)	NM	NM	1,442	53%		17%	21%	PU8	1989	3/31	(408) 496-7142
88	102	Intuit	419		27.6	64	553	32%		28.0	1%		2,300					PU8	1983	7/31	(800) 624-8742
89	77	Cray Communications	418										3,000					PU8	1953	4/30	(800) 227-3134
90	85	Exide Electronics	391	31%	7.0	102	481	23%	17%	(0.7)	NM	-35%	1,500	33%	11%	3%	2%	PU8	1962	9/30	(919) 870-3239
91	104	Attachmate	391										1,300					PRI	1983	12/31	(800) 644-4010
92		Qualcomm	387		30.2	61	814	111%		21.0	-30%		4,200			21%	20%	PU8	1985	9/30	(800) 236-3672
93	139	America Online	384		(35.8)	135	1,094	185%	105%	29.8	NM	75%	2,500	112%		13%	2%	PU8	1985	6/30	(703) 448-8700
94		Telxon	380		9.0	92	487	28%		16.5	83%							PU8	1969	3/31	(800) 800-8002
95	86	Standard Microsystems	379	47%	24.2	68	342	-10%	31%	11.6	-52%	57%	861	0%	12%	7%	9%	PU8	1971	2/28	(516) 435-6000
96	94	PictureTel	347		19.6	74	477	37%	44%	32.5	65%		1,150	9%		13%	13%	PU8	1984	12/31	(508) 292-5000
97	90	BMC Software	345	39%	77.5	43	429	24%	27%	105.6	36%	34%	1,186	22%	19%	25%	24%	PU8	1980	3/31	(713) 918-8800
98	117	StrataCom	332	43%	52.5	49	460	39%		12.9	-75%		1,208			18%	4%	PU8	1986	12/31	(800) 877-0519
99	109	Infonet Services	320				380	19%	26%				1,300	8%	12%			PRI	1980	3/31	(310) 335-2600
100	99	GENICOM	294	35%	6.0	107							1,638	2%	-8%	3%		PU8	1983		(800) 436-4266
101	98	Network Equipment Tech.	284	20%	27.1	65	339	19%	20%	31.4	16%	NM	1,189	11%	6%	12%	11%	PUB	1983	3/31	(415) 366-4400
102	147	PLATINUM Technology	276	24%	(112.5)	145	431	56%	29%	(14.1)	-87%	4%	700	471%		34%	37%	PU8	1987	12/31	(800) 890-7528
103	92	Group Technologies	275										2,200	-32%	13%			PU8	1989	12/31	(813) 972-6000
104	100	Pyramid Technology	263		7.4	99	312	19%	6%	13.8	88%	3%	975			10%	9%	PU8	1981	9/30	(800) 289-7973
105	97	Information Builders	255	33%			280	10%					1,750	3%				PRI	1975	12/31	(212) 736-4433
106	79	Borland International	254	45%	(12.1)	130	215	-15%		14.2	NM		1,100	36%		24%	21%	PU8	1983	3/31	(408) 431-1000
107	111	Consolidated Comm.	250		14.0	81	275	10%	17%	15.0	7%	16%	1,400	11%	8%			PRI	1984	12/31	(217) 235-4456
108	121	Mobile Telecomm. Tech.	246	4%	(9.9)	128				(52.0)	425%		1,000					PU8	1987	12/31	(800) 759-3228
109	103	General DataComm	221		(1.4)	117	235	6%	4%	(0.9)	-36%	NM	1,849	0%	-1%	13%	13%	PUB	1969	9/30	(203) 574-1118
110	108	FileNet	215	34%	14.8	80	273	27%	18%	18.3	24%	18%	1,300			9%	13%	PUB	1985	12/31	(714) 966-3400
111	114	Hypercom	208	46%			230	11%	39%				600	17%	23%	9%	10%	PRI	1978	6/30	(602) 504-5000
112	106	The Santa Cruz Operation	199		(6.1)	124	209	5%	9%	13.1	NM	NM	1,071	1%	0%	16%		PU8	1979	9/30	(800) 726-8649
113	122	Aspect Telecomm.	199	23%	24.0	69	292	47%	46%	35.9	50%	NM	950			12%	11%	PU8	1985	12/31	(408) 325-2200
114	107	Advanced Logic Research	192	43%	4.9	108	218	13%	-1%	10.6	116%	-6%	475	5%	-7%	2%	2%	PU8	1984	9/30	(714) 581-6770
115	95	Hayes Microcomputer	190										1,100					PRI	1978	9/30	(770) 840-9200
116	101	Network Systems Group	190	33%	9.0	93												PU8	1974	12/31	(800) 328-9108
117	132	ADTRAN	182	6%	16.2	78	256	41%	43%	16.1	-1%	20%	700	71%	40%	10%	10%	PU8	1986	12/31	(800) 923-8726
118	124	Progress Software	180										1,100					PU8	1981	11/30	(800) 477-6473
119	110	Datapoint	175		(28.3)	134							991			2%		PU8	1969	7/31	(800) 733-1500
120	133	Madge Networks (U.S.)	173															PU8	1986	12/31	(408) 955-0700
121	141	Microdyne	170	30%	12.6	86	150	-12%	22%	2.2	-83%	-24%	588	-2%	36%	3%	4%	PUB	1984	12/31	(703) 329-3700
122		IDEA Associates	170										1,300					PRI	1982		(800) 257-5027
123	130	Dialogic	169	23%	17.1	77	212	25%	33%	20.9	22%	32%	685			17%	18%	PU8	1983	12/31	(201) 993-3000
124		Cognos	168		11.3	89	208	24%		23.9	112%		1,000			13%	15%	PU8	1969	2/28	(800) 426-4667
125	119	Teleport Comm. Group	166		(53.8)	140	277	66%	42%	(133.0)	147%	NM	1,499	22%	51%	1%	1%	PUB	1983	12/31	(718) 355-2000
126	129	Digi International	165		19.3	75	194	18%	31%	15.4	-20%	14%	605	16%	26%	9%	10%	PUB	1983	9/30	(612) 912-3444
127	144	Xyplex	159	27%	7.8	98							950			5%		PU8	1981	10/31	(800) 338-5316
128	126	Boole & Babbage	154	64%	13.9	82	167	8%	11%	17.7	27%	NM	754	8%	5%	12%	11%	PU8	1967	9/30	(408) 526-3000
129	134	Digital Microwave	154		2.0	113	150	-2%		(6.0)	NM		500	15%		7%	7%	PU8	1984	3/31	(408) 943-0777
130	112	Allied Telesyn Int'l	153										500	20%				PRI	1987	12/31	(408) 730-0950
131	105	BBN Systems & Tech.	153				164	7%								5%	5%	PU8	1948	6/30	(617) 873-4000
132	194	Ascend Communications	150	29%	30.6	60	522	249%	178%	118.9	289%	NM	307			6%	7%	PU8	1989	12/31	(510) 769-6001
133	120	Best Power	149										1,200	0%				PU8	1977	12/31	(800) 356-5794
134	136	Converse Technology	146										1,008					PUB	1984	12/31	(516) 677-7200

1995 Revenue Rank	Chair	CEO	President	Sales	Products and Services	Notes
68	Charles O. Rossati	Paul A. Brands	Philip M. Giuntini		Business and information technology consulting	
69	Paul Kozlowski	Paul Kozlowski			Digital/ISDN access, frame relay, fiber, managed networks	Subsidiary of Racal Electronics Plc (GB)*
70	Dr. Henry Simon	Dr. John Millard	Dr. John Millard	Greg Spierkel	Telephone switches, computer telephony integration systems	Candian company
71	Sam Wyly	Sterling L. Williams	Sterling L. Williams		Electronic commerce applications, systems mgmt., prof. services	
72	William Cadogan	William Cadogan	William Cadogan		Transmission systems, network integration	
73	Henry F. Frigon		Peter Van Camp	Chester Scott	Internet access, remote access, transaction services	Subsidiary of H&R Block
74	James Crowe	James Crowe	John Sidgmore		Local/long-distance services, Internet access	
75		Paul Wahl	Jeremy Coote		Client/server enterprise applications	Subsidiary of SAP AG (Ger.)*
76	Dr. Jerome Swartz	Dr. Jerome Swartz	Tomo Razmilovic	Frank Borghese	Wireless LAN products, handheld computers	
77	Karl C. Powell	Karl C. Powell	John McAdam		SMP systems, decision support, Internet-based applications	
78		Roger B. Dowdell Jr.	Roger B. Dowdell Jr.	Asa Davis	Uninterruptible power supplies, power protection/conditioning	
79	Keith Bailey		Henry Hirsch	Thomas Griffin	Sys. integration, network design/monitoring svcs., data/voice systems	
80		John Reno	Alex Saunders	John Olsen	LAN/WAN access switches, matrix switches, packet switches	
81	Robert Cohn	Robert Cohn	W. Michael West	Paul Scott	Voice/E-mail servers	
82	Philip F. Otto	Philip F. Otto	Philip F. Otto		Satellite earth stations/microwave radios	
83	John Adler	Grant Saviers	Grant Saviers	Dick Gourley	Adapters/interface cards, ATM networking, recordable CD, RAID	
84	John P. Imlay	John P. Imlay			Client/server application suites	Subsidiary of Geac Computer (10/96)
85	W. Douglas Hajjar	James E. Ousley	James E. Ousley	Arnold Rutgers	Messaging/directory integration, CAD, software and services	
86	C. Baker Cunningham	C. Baker Cunningham	C. Baker Cunningham	Mike Murphy	Copper/fiber-optic network cables	
87	Carl Carman	Gordon Eubanks Jr.	Gordon Eubanks Jr.	Dana Siebert	Remote computing, security	
88	Scott Cook	William Campbell	William Campbell	John Monson	Finance/tax preparation software	
89	Roger Holland	Donald Sullivan	Donald Sullivan	Gary Smith	Packet switches, T-1/stat muxes, routers, hubs, gateways	Subsidiary of Cray Electronics Plc (GB)*
90	Conrad Plimpton	James A Risher	James A. Risher	Mark Ascolese	Power management systems	
91	Frank W. Pritt	Jim Lindner	Jim Lindner	Barry Horn	Universal information access software/services	
92	Dr. Irwin Jacobs	Dr. Irwin Jacobs	Harvey P. White		E-mail, Internet, networking software	
93	Steve Case	Steve Case	Steve Case	Myer Berlow	Internet access	
94	Robert F. Meyerson	Robert F. Meyerson	Frank Brick	James Cleveland	Wireless mobile computers and networks	
95	Paul Richman	Paul Richman	Paul Richman		PC LAN system products, semiconductors	
96	Norman E. Gaut	Norman E. Gaut	Norman E. Gaut	Steven Crummey	Videoconferencing/teleconferencing equipment	
97	Max Watson	Max Watson	Max Watson	Rick Gardner	Application management optimization, DBMS software	
98	Richard M. Moley	Richard M. Moley	Richard M. Moley	John G. Kirsch	Switching equipment for WANs, fast-packet switching	Subsidiary of Cisco Systems (4/96)
99	Jose A. Collazo	Jose A. Collazo	Jose A. Collazo	John Hoffman	Integrated voice/data/fax, private intranet, TCP/IP network services	
100	Don E. Ackerman	Paul T. Winn	Paul T. Winn	Jim McWilson	Printers, printer supplies distributor	
101	Hans Wolf	Joseph J. Francesconi	Joseph J. Francesconi	Ed Peverell	Multiservice backbone networks and associated services	
102	Andrew Filipowski	Andrew Filipowski	Andrew Filipowski	Thomas Slowey	Systems management, data warehousing	
103		Carl P. McCormick	Carl P. McCormick	J. Hardie Harris	Advanced manufacturing, engineering and testing services	
104	John Chen	Ed Blechschmidt	Ed Blechschmidt	Dick Moore	Scalable enterprise computing systems and servers	Subsidiary of Siemens Nixdorf AG (Ger.)*
105	Gerald D. Cohen	Gerald D. Cohen	Gerald D. Cohen	David R. Kemler	Data access/reporting, Web application development, data warehouse	
106	William F. Miller	Whitney Lynn	Whitney Lynn	Larry Brand	Compilers, languages, DBMS/file mgmt.	
107	Richard A. Lumpkin	Richard A. Lumpkin	Robert J. Currey	Joseph R. Dively	Local/long-distance telecom, telemarketing, operator/billing svcs.	
108	John Palmer	John J. Stupka	John J. Stupka	Ray O'Brien	Wireless communications, global wireless messaging	Parent of Skytel
109	Charles P. Johnson	Charles P. Johnson	Ross A. Belson	V. Jay Damiano	ATM switches, network access, transmission products	
110		Ted Smith	Ted Smith	Fred Selby	Workflow, document imaging, document mgmt.	
111	George R. Wallner	Al Irato	Al Irato	Chuck Hellquist	Switches, hybrid routers, frame relay access devices	
112		Alok Mohan	Alok Mohan	Ed Adams	Unix system software, client/server integration software	
113	James R. Carreker	James R. Carreker	Dennis L. Haar	Larry S. Miller	ACDs, interactive response	
114	Gene Lu	Gene Lu		Dave Kirkey	Client/server and high-performance desktop systems	
115		Dennis C. Hayes	Dennis C. Hayes	Gary Franza	Facsimile boards, intelligent modems, networking software	
116	David E. Weiss	David E. Weiss	David E. Weiss	Tom Gooch	Tape/disk software, routers	Subsidiary of StorageTek
117	Mark C. Smith	Mark C. Smith	Howard Thrailkill	Steve Harvey	Digital telecom equipment for telcos and end users	
118			Joseph Alsop	Cary Johnson	Application development tools and DBMS	
119	Asher B. Edelman	Asher B. Edelman	Doris D. Bencsik	David Berger	Computer systems, network integration software	
120	Robert Madge	Robert Madge	Rick Ellinger	John Rouse	LAN/WAN switches, adapter cards,enterprise mgmt. software	Subsidiary of Madge Networks NV (Neth.)
121	Philip T. Cunningham	Philip T. Cunningham	Philip T. Cunningham	David G. Laposata	Network interface cards, hubs, switches, ancillary products	
122		Gautam Gupta	Gautam Gupta	Nora Gildea	Routers, printers, communications software	
123	Nick Zwick	Howard Bubb	Howard Bubb	John Alfieri	Voice processing and voice/network interface	
124	James M. Tory	Renato Zambonini	Renato Zambonini	Terry Hall	Reporting tools, fourth-generation languages	Canadian company
125	Robert Annunziata	Robert Annunziata	Robert Annunziata	Stuart Mencher	Local telecom, value-added network services	
126	John P. Schinas	Ervin F. Kamm Jr.	Ervin F. Kamm Jr.	Dana Nelson	Datacom hardware/software for remote access and LAN markets	
127	Joseph F. Alibrandi	Michael Thurk		Nick Ganio	Network management, routers, switches, remote access servers, hubs	Subsidiary of Whittaker (3/96)
128	Franklin Johnson Jr.	Paul E. Newton	Paul E. Newton	Tim Dreisbach	Enterprise availability management	
129		Charles D. Kissner	Charles D. Kissner	Graham J. Powell	Digital microwave radios	
130	Takayoshi Oshima	Takayoshi Oshima		Anders Swahn	Hubs, switches, adapters, repeaters, bridges, network management	
131			David Campbell		Internet technologies and information systems, services and products	Subsidiary of BBN
132		Mory Ejabat	Mory Ejabat	Mike Hendren	Remote, LAN/Internet/multimedia access, videoconferencing	
133	Gurcharn Dang	Gurcharn Dang	Gurcharn Dang	John Lombardi	Power protection and systems software	Unit of General Signal
134	Kobi Alexander	Kobi Alexander	Kobi Alexander		High-performance systems, voice messaging, multimedia software	

1995 Revenue Rank	1994 Revenue Rank	Company	1995 Revenue $M	1995 Revenue % Int'l	1995 Profits $M	1995 Profits Profit Rank	1996 Estimated Revenue $M	1996 Estimated Revenue '95-'96 %Δ	1996 Estimated Revenue '91-'96 CAGR	1996 Estimated Profits $M	1996 Estimated Profits '95-'96 %Δ	1996 Estimated Profits '91-'96 CAGR	Number of Employees 1995	Number of Employees '95-'96 %Δ	Number of Employees '91-'96 CAGR	R&D % Rev. 1995	R&D % Rev. 1996	Pub/ Pri	Year Inc.	Fiscal Year Ends	Phone
135	155	Boca Research	144		9.5	90	92	-36%		5.4	-43%		350	9%				PUB	1985	12/31	(561) 997-6227
136	116	Software AG America	143	15%			150	5%	9%				730	3%	2%	2%	1%	PRI	1973	12/31	(703) 860-5050
137		Centron	143	5%			190	33%	16%				167	27%	19%			PRI	1984	12/31	(612) 829-2800
138	125	Wavetek	140															PRI	1962	9/30	(619) 279-2200
139	135	Network General	140	22%	25.4	66	189	35%	32%	27.4	8%	38%	572	26%	37%	14%	15%	PUB	1986	3/31	(415) 473-2000
140	113	Net. Computing Devices	139	33%	(4.0)	120							348			9%		PUB	1988	12/31	(415) 694-0650
141	148	FTP Software	136										474					PUB	1986	12/31	(508) 685-4000
142	184	Cascade Communications	135	16%	25.4	67	330	145%		67.0	164%	132%	421	138%	132%	15%		PUB	1990	12/31	(508) 692-2600
143	140	Multi-Tech Systems	132				172	30%	21%				373	10%	12%			PRI	1970	12/31	(800) 328-9717
144	145	Cheyenne Software	128	41%	38.5	53	175	36%	84%	27.2	-29%	17%	621	25%	68%	12%	14%	PUB	1985	6/30	(516) 465-4000
145	127	Xircom	127	43%	(58.8)	142	193	53%	49%	7.0	NM	24%	500	60%	63%	11%		PUB	1988	9/30	(805) 376-9300
146	173	NetManage	125	21%	22.3	71	128	2%		12.0	-46%		618			19%	24%	PUB	1990	12/31	(408) 973-7171
147	128	Gandalf Technologies	121	73%	1.0	115	116	-4%	-2%				897	-9%	-10%	8%	10%	PUB	1970	3/31	(800) 426-3253
148	153	InteCom	120										650					PRI	1979	12/31	(800) 468-3266
149	158	Shiva	119	46%	(4.8)	122	211	77%	31%				504	39%	16%	13%	10%	PUB	1985	12/28	(617) 270-8300
150	156	Auspex Systems	116		12.4	87	163	41%		19.8	60%					13%	11%	PUB	1987	6/30	(408) 986-2000
151	115	Compression Labs	113		(57.0)	141							535	-35%		9%		PUB	1976	12/31	(408) 922-4610
152	152	WRQ	112	40%									525					PRI	1981	12/31	(206) 217-7500
153	154	Optical Data Systems	112	12%	13.7	83	122	9%	7%	13.0	-5%	9%	345	12%	5%	6%	9%	PUB	1983	12/31	(972) 234-6400
154	142	Wall Data	111	28%	11.7	88										18%		PUB	1982	12/31	(206) 814-9255
155	175	Pairgain Technologies	107		1.1	114	191	79%	149%	30.2	2776%	NM	400	13%		10%	9%	PUB	1988	12/31	(714) 832-9922
156	217	FORE Systems	106	35%	12.9	85	235	122%	372%	9.7	-24%	245%	473	107%	187%	12%	13%	PUB	1990	3/31	(412) 772-6600
157	118	Banyan Systems	105	28%	(21.3)	132	124	18%	16%	2.2	NM	-5%	725			23%	18%	PUB	1983	12/31	(508) 898-1000
158	164	Eicon Technology	99		8.0	97	111	12%		(2.8)	NM					3%	4%	PUB	1984	6/30	(972) 239-3270
159	131	TIE/communications	98				103	6%									5%	PRI	1971	12/31	(913) 344-0400
160		Zoom Telephonics	97	20%	6.1	106							312	6%	35%	2%		PUB	1977	12/31	(617) 423-1072
161	177	Microcom	93	29%	7.2	100	146	57%	22%	12.4	72%	NM	370			10%	11%	PUB	1980	3/31	(800) 822-8224
162	150	Data Switch	91										449					PUB	1977	12/31	(203) 926-1801
163	199	McAfee	90	29%	14.9	79	170	89%	89%				250	60%	68%	10%		PUB	1992	12/31	(408) 988-3832
164	230	RAD Data Comm.	90	72%			110	22%	20%				500	4%	13%	18%	17%	PRI	1981		(201) 529-1100
165	169	Boston Technology	89		12.9	105	105	18%		(14.8)	NM		419	67%		15%	21%	PUB	1986	1/31	(617) 246-9000
166	143	Telco Systems	89		6.2	84	93	5%	-2%	(15.0)	NM	NM	436	3%	0%	20%	20%	PUB	1984	8/31	(617) 557-0300
167	157	Micom Communications	88		7.2	101							411	-4%		10%		PUB	1973	3/30	(805) 583-8600
168		Interleaf	88		(48.3)	139	89	1%	1%	0.3	NM	NM				19%	18%	PUB	1981	3/31	(617) 290-0710
169	165	GE American Comm.	87										500					PUB	1986	12/31	(609) 987-4000
170		Global Village Comm.	86		(7.6)	125	144	68%		8.8	NM		300			12%	11%	PUB	1989	3/31	(800) 948-4547
171	138	Artisoft	84		(5.8)	123	61	-27%	8%	(18.3)	216%	NM	335	4%	9%	10%	11%	PUB	1982	6/30	(520) 670-7100
172		Netscape Comm.	81		(3.4)	118	318	295%		20.2	NM					31%	24%	PUB	1994	12/31	(415) 937-2555
173	162	Computer Network Tech.	79	29%	4.0	109	94	19%	34%	9.7	141%	37%	417			16%		PUB	1983	12/31	(612) 797-6000
174	237	Accton Technology	78																1988		(408) 452-8900
175	151	NetFRAME Systems	76	14%	(8.1)	127	93	22%	35%	(7.3)	-10%	15%	284			16%	17%	PUB	1986	12/31	(408) 474-1000
176	149	Proteon	76	30%	8.2	96	70	-7%	-6%				250	-14%	-14%	12%		PUB	1974	12/31	(508) 898-2800
177		Emulex	75	47%	3.9	110	51	-32%		(9.3)	NM	NM	312	-4%		14%	22%	PUB	1979	6/30	(714) 662-5600
178	174	Tekelec	75	25%	6.3	104	70	-7%	6%	(3.0)	NM	NM	314	9%		20%	26%	PUB	1979	12/31	(818) 880-5656
179		Quarterdeck	71										200					PUB	1982	9/30	(310) 309-3700
180		MaxTech	70										200					PRI	1985	12/31	(310) 921-1698
181	163	Centigram Comm.	69		(4.1)	121							360	11%				PUB	1980	10/31	(408) 944-0250
182	192	Memotec Comm.	66		(10.1)	129							300	0%		12%		PUB	1994	12/31	(514) 738-4781
183	179	VTEL	66		3.8	111	90	37%	52%	(7.7)	NM		465	8%		16%	15%	PUB	1986	7/31	(512) 314-2700
184	170	Centura Software	66	61%	(44.1)	137							299			22%		PUB	1984	12/31	(800) 446-8782
185	198	Hummingbird Comm.	64		20.3	73	102	59%	127%	30.8	52%		139	70%	69%	8%	11%	PUB	1984	9/30	(416) 496-2200
186	183	Cubix	62										180	0%	15%			PRI	1975	11/30	(800) 829-0550
187	160	Asante Technologies	61	28%	(3.7)	119	67	10%	29%	(0.5)	-88%	NM	160	25%	23%	7%	9%	PUB	1988	9/30	(408) 435-8388
188	159	Tricord Systems	60	11%	(37.2)	136							211			14%		PUB	1987	12/31	(800) 874-2673
189	225	CNet Technology	60										280					PRI	1987	12/31	(408) 954-8000
190	167	Penril DataComm Nets.	58										445					PUB	1968	7/31	(800) 736-7451
191	171	Farallon Computing	57	30%	2.5	112	61	7%	7%	3.4	36%	NM	210	9%	-4%	15%	15%	PUB	1986	9/30	(510) 814-5100
192	166	Telebit	56															PRI	1982	12/31	(508) 441-2181
193	188	Networth	55		(22.9)	133							268			8%		PUB	1984	6/30	(214) 929-1700
194	210	Apertus Technologies	55	13%	9.3	91	49	-10%	13%	(8.0)	NM	NM	350	-14%		20%	26%	PUB	1979	3/31	(612) 828-0300
195	137	Olicom USA	52		(0.2)	116							97					PUB	1991	12/31	(800) 205-4266
196		PC DOCS	52	19%	6.5	103	81	56%		12.4	91%		322	40%		24%	14%	PUB	1989	6/30	(416) 497-7700
197	182	RAM Mobile Data	52										300					PRI	1990	12/31	(800) 726-3210
198	185	Xylogics	50										212					PUB	1985	10/31	(800) 225-3317
199	189	Procom Technology	50				75	50%					140	41%				PRI	1987	7/31	(714) 852-1000
200	207	Tivoli Systems	50		5.5								201					PUB	1989	12/31	(512) 794-9070

Footnotes: NM=Not measurable CAGR=Compound annual growth rate *U.S.-based operations only

1995 Revenue Rank	Chair	CEO	President	Sales	Products and Services	Notes
135	E. Roe Stamps IV	Anthony Zalenski	Anthony Zalenski	Larry Steffann	PC controller boards	
136	Dr. Erwin W. Koenigs	Dr. Erwin W. Koenigs	Daniel F. Gillis		Database, data warehouse, application development, middleware	Subsidiary of Software AG (Ger.)*
137		Rick Soskin	Rick Soskin	Warren Pillsbury	Network management, routers, hubs, switches, front-end processors	Subsidiary of GATX Capital Corp.
138	Dr. Terence Gooding	Dr. Terence Gooding	Dr. Terence Gooding	Ben Constantini	Test/measurement instrumentation, calibration equipment	
139	Harry Saal	Leslie G. Denend	Leslie G. Denend	Richard H. Lewis	Network analyzers, network management	
140	Peter Preuss	Robert G. Gilbertson	Robert G. Gilbertson	Cecil Dye	Network computing products	
141	David H. Zirkle	David H. Zirkle	David H. Zirkle	Penny Leavy	Internet software solutions, remote access, Internet access software	
142	Victoria Brown	Daniel E. Smith	Daniel E. Smith	Michael A. Champa	ATM, frame relay, SMDS, TCP/IP, WANs	
143	Raghu Sharma	Raghu Sharma	Raghu Sharma	Thomas Heimerman	Modems, multiplexers, servers, routers, communications software	
144	ReiJane Huai	ReiJane Huai	ReiJane Huai	Alan Kaufman	Storage management, communications, antivirus software	Subsidiary of Computer Assoc. (10/96)
145	Dirk Gates	Dirk Gates	Dirk Gates	Scott Coleman	PC card remote access products	
146	Zvi Alon	Zvi Alon	Zvi Alon		TCP/IP protocol stacks, terminal-emulation software	
147	Thomas A. Vassiliades	Thomas A. Vassiliades	Richard Busto		Remote access and internetworking solutions	Canadian company
148		George C. Platt	George C. Platt	John McDonald	Integrated application solutions, switching systems	
149	Frank Ingari	Frank Ingari	Frank Ingari	Woody Benson	Remote access hardware/software, internetworking products/services	
150	Larry Boucher	Bruce Moore	Bruce Moore	Mike Stevens	High-performance file servers, high-availability software and networks	
151	Art Anderson	Gary Trimm	Gary Trimm	Ted Augustine	Videoconferencing	
152			Doug Walker	Kevin Klustner	PC connectivity, network management software	Formerly Walker Richer Quinn
153	Ward Paxton	Ward Paxton	Ward Paxton	Joe Howard	Switches, routers, bridges, network management modules	
154	James Simpson	James Simpson	John R. Wall	Michael Rogers	Information access and data management software	
155	Charles S. Strauch	Charles S. Strauch	Howard S. Flagg	Stuart Davis	HDSL carrier, HDSL campus products	
156	Eric Cooper	Eric Cooper	Onat Menzilcioglu	Mike Green	ATM switches/adapters, LAN switches, WAN multiplexers	
157	David C. Mahoney	David C. Mahoney	David C. Mahoney	Joseph Campbell	Network enterprise directory technology/services	
158	Peter Brojde	Peter Brojde	Peter Brojde	Mark Popkiewicz	Desktop/server integration, information access solutions	Subsidiary of Eicon Corp. (Can)
159	Paul H. Pfleger	Charles B. McNamee	Charles B. McNamee	Steve Ward	Phone systems, long distance, videoconferencing, Internet access	Subsidiary of SP Investments
160	Frank Manning	Frank Manning	Frank Manning	Terry Manning	Fax modems, voice/fax modems, cellular fax/modems, routers	
161	James Dow	Roland Pampel	Roland Pampel	Bob Lamkin	Modems, remote access, remote control tools, network mgmt.	
162	William J. Lifka	William J. Lifka	William J. Lifka	Anthony J. Fusarelli	Electronic switching/control systems, channel extension systems	
163	William Larson	William Larson	William Larson	Mark Woodward	Antivirus/system management/help desk software	
164	Zohar Zisapel		Amnon Presler		Frame relay, remote access, modems, T-1 DSU/CSUS, FDDI	
165	Greg C. Carr	Francis E. Girard	Francis E. Girard	Carol B. Langer	Voice and information processing systems	
166	John Ruggiero	Will Smith	Will Smith	Bill Waters	Broadband, loop access, LAN interconnection, wireless	
167	Barry Phelps III	Barry Phelps III	Gilbert Cabral		Modems, multiplexers, terminal servers, bridges, routers, gateways	
168	David Boucher	Ed Koepfler	Ed Koepfler	Mark Cieplik	Document management publishing, consulting	
169		John Connelly			Satellite communications solutions	Subsidiary of GE Capital Services
170	Leonard A. Lehmann	Neil Selvin	Neil Selvin	Douglas Dennerline	Fax/modems, Internet fax servers/software, Internet access servers	
171	William C. Keiper	William C. Keiper	Joel J. Kocher	Bryan Moynahan	Remote communications, computer telephony	
172	Jim Clark	Jim Barksdale	Jim Barksdale	Todd Rulon-Miller	Client/server and commercial Internet applications	
173	John A. Rollwagen	Tom Hudson	Tom Hudson	Richard G. Helgeson	Data center/storage networking, channel extension	
174	Shi-Tien-King	Yimin Doo	Yimin Doo		Hubs, switches, LAN adapters, network software, internetworking	
175	Bob Puette	Bob Puette	Bob Puette	Rob VanNaarden	Network servers for Microsoft NT and Novell NetWare	
176	Howard Salwen	Daniel J. Capone Jr.	Daniel J. Capone Jr.	Timothy Greer	Remote access routers	
177	F.B. Cox	P.F. Folino	P.F. Folino	M.A. Peitler	Remote access servers, server-based routers, fiber channel adapters	
178	Jean-Claude Asher	Philip Alford	Philip Alford		Advanced diagnostic and testing equipment, network switches	
179	Frank LaHaye	Gaston Bastiaens	Gaston Bastiaens		Utilities, remote computing and Internet software	
180			Gary Fan		UNIX-based applications and solutions	Subsidiary of GVC (Taiwan)*
181		George H. Sollman	George H. Sollman	Dennis Barsema	Voice, fax, data and E-mail messaging	
182	Richard Drouin	Marco Genoni			Network products, integrated solutions for WANs, data/voice comm.	Canadian company
183	F.H. (Dick) Moeller	F.H. (Dick) Moeller		Mike Cronin	Interactive multimedia videoconferencing systems	
184	Sam Inman	Sam Inman	Sam Inman	Mike Keddington	Web and client/server application development tools	Formerly Gupta
185	Fred Sorkin	Fred Sorkin	Fred Sorkin	Jan Adamek	Network software, document distribution solutions	Canadian company
186	Donald Lehr	Donald Lehr	Allen Fiegeher	Gary Beverage	Remote access dial-up communication servers	
187	Jeff Lin	Jeff Lin	Jeff Lin	Jim Cansler	Hubs, switches, adapter cards, network mgmt/acceleration software	
188	Yuval Almog	John J. Mitcham	John J. Mitcham	Robert Babbitt	Scalable midrange servers for mission critical environments	
189	John Hsien		Simon Chang		Ethernet cards/hubs	
190	Henry D. Epstein	Henry D. Epstein	Henry D. Epstein	James Gallagher	LAN/WAN access, modems, multiplexers, bridges, routers	Subsidiary of Bay Networks (8/96)
191	Reese Jones	Alan Lefkof	Alan Lefkof	Tom Skoulis	Internet connectivity, collaborative software, LAN products	
192	James D. Norrod	Bruce E. Johnson	Bruce E. Johnson	Gerry Pagano	Remote access servers, WAN interface cards	Subsidiary of Cisco Systems (8/96)
193	John F. McHale	John F. McHale	John F. McHale	Bill Steele	Intelligent hubs, network management, workgroup products	
194	Robert Gordon	Robert Gordon	Robert Gordon	Liz Converse Wilson	Software for integrating diverse computer environments	
195		Michael Camp	Michael Camp	John Meaney	Network interface cards, hubs, bridges, routers, adapters	Subsidiary of Olicom A/S (Den.)*
196	Rubin Osten	Rubin Osten	Rubin Osten		Systems integration services, software/hardware support services	Canadian company
197	Michael Kulukundis	William Lenahan	William Lenahan	Doug Roberts	Wireless data communications services and solutions	
198	Frank Pipp	Bruce I. Sachs	Bruce I. Sachs	Grace M. Carr	Printed circuit board controllers, data storage devices	Subsidiary of Bay Networks (1/96)
199	Alex Razmjoo	Alex Razmjoo	Alex Razmjoo	Dave Streipch	CD arrays, CD digital linear tape and DLT	
200		Franklin Moss	Franklin Moss	Alex Kuli	Data center management software	Subsidiary of IBM (2/96)

Oracle seems to be using the Web energy to its advantage. The company pumped up revenue 42% to $4.2 billion and profits 37% to $603 million.

Sybase, on the other hand, is still struggling. It was expected to close 1996 with revenue up 6% to $1 billion, but with a loss of $20 million, about the same size loss it had in 1995.

Sun Microsystems, Inc. is another company milking the Web for all it's worth.

Besides the fact that the company's workstations are popular Web server platforms, Sun has created a whole industry around its Java programming language, perhaps the one serious threat to Microsoft's hegemony in desktop software development.

Sun's revenue was up 20% in 1996 to $7 billion, leapfrogging the company past Unisys Corp. and making it the sixth largest computer maker. Profits were up 34% to $476 million.

As an example of how the Web has become so central to everything networking, after the fall NetWorld+ Interop conference in Atlanta, show organizers decided to fold the nascent DotCom intranet conference back into the main Interop event.

They apparently realized what many showgoers did: Having all intranet-related session material in a side conference left little of consequence under the big tent.

If 1996 was the year the Web arrived, 1997 will be the year it grows up. As far as we have come in one year, the real promise of intranets and Web computing still lies ahead, as do many challenges, including everything from Web security to true legacy integration.

While the Web won't dictate the outright fortunes of the Network World 200 this year, it will probably be the single largest blip on the crowded radar screens for most of these industry leaders.

Other persistent distractions will be:

- Remote access, the single biggest concern of the '90s by the accounts of some analysts, because 95% of customer contact takes place in branch offices.
- Network management, with a particular emphasis on virtual LAN environments.
- LAN and ATM cell switching, which are still seen as the savior of shared-media LAN environments.
- Wide-area switched technologies, making it possible to build enterprise networks that provide LAN performance end-to-end.

Stay tuned.

A GLOBAL ECONOMY

THE LEADERS IN OVERSEAS SALES

1995 Revenue Rank	Company	% International Revenue 1996 (Estimated)
147	Gandalf Technologies	80%
164	RAD Data Communications	77%
58	Newbridge Networks	67%
128	8oole & 8abbage	63%
33	National Semiconductor	58%
25	AMP	57%
30	Oracle	57%
95	Standard Microsystems	56%
70	Mitel	53%
161	Microcom	53%
43	3Com	53%

THE OTHER 40: THE UP-&-COMERS

1995 Revenue Rank	1994 Revenue Rank	Company	1995 Revenue $M	Number of Employees 1995	Year Inc.	Phone	President	Products & Services
201	181	Netrix	48	187	1985	(703) 742-6000	Charles W. Stein	Telecom switching
202	172	Tally Printer	48	312	1948	(206) 251-5500	William Munro	Computer printers, supplies, service
203	193	Interphase	47	200	1977	(800) 327-8638	R. Stephen Polley	ATM and FDDI adapters
204	197	Network Peripherals	47		1989	(408) 321-7300	Pauline Lo Alker	Switching hubs, network adapters, Ethernet and Fast-Ethernet hubs
205	189	Graphnet	45	200	1987	(800) 327-1800	Yaakov Elkon	Packet-switched network
206		Wandel & Goltermann	45	250	1984	(919) 941-5730	Gerry Chastelet	Electronic test equipment
207	186	CrossComm	44	250	1987	(800) 388-1200	B. J. Johnson	High-speed network information structures
208	212	ON Technology	44	292	1985	(617) 374-1400		Network security, group scheduling, E-mail, network management
209	195	Digital Link	44	211	1985	(408) 745-6200	Vinita Gupta	Data communications access products for public & private WANs
210	209	Transaction Network Services	41	99	1990	(703) 453-8300	John J. McDonnell Jr.	Data communications services for transaction-oriented applications
211		TyLink	41				Robert Degan	Advanced circuit management products for WANs
212	196	Integrated Network	40	120	1985	(908) 218-1507	Yo-Sung Cho	Multimedia broadband, network access equipment
213	200	Larscom	40	195	1970	(408) 988-6600	Deborah Soon	High-speed WAN access equipment
214	227	Remedy	40	226	1990	(415) 903-5200		Client/server software to automate help desk/support/business processes
215		MRV Communications	39	200	1988	(818) 773-0900	Noam Lotan	Computer networking and fiber-optic transmission
216		PSINet	39	625	1989	(703) 904-4100	William L. Schrader	Dial-up for LAN remote access, Web hosting/security/intranet
217	176	Retix	39	370	1985	(800) 255-2333	Joe Stephen	LAN networking equipment/software/services
218		Davox	38	230	1987	(508) 952-0200	Alphonse Lucchese	Unified call-center products
219	202	Everex Systems	37	150	1993	(800) 821-0806	Wen-Chi Chen	PCs, notebooks, peripherals
220	168	Telenex	37	275	1983	(800) 222-0187	Robert Coackley	Data communications test equipment/network control systems
221	180	ZyXel	36	30	1989	(800) 255-4101	Gordon Yang	High-speed modems, communications servers, high-speed serial cards
222		Advanced Computer Comm.	35		1991	(805) 685-4455	8ert Whyte	8ridges, routers, network management software
223	205	Lantronix	35	65	1989	(800) 422-7055	8rad Freeburg	Ethernet LAN products
224		Cylink	35	267	1984	(408) 735-5800	Fernand Sarrat	Enterprise information security, wirelesss telecom, microwave radio
225	216	Brooktrout Technology	34	90	1984	(617) 449-9009	Eric Giler	Software communications/systems, PC boards, fax boards
226	208	XcelleNet	34	246	1986	(770) 804-8100	Dennis M. Crumpler	Remote access utility software
227		Sync Research	34	162		(714) 580-2070	Roger Dorf	WAN access, digital transmission and circuit management
228		Security Dynamics Technologies	34	158	1984	(617) 687-7000	Charles R. Stuckey Jr.	Enterprisewide network security products
229	204	Applied Voice Technology	32	110	1982	(206) 820-6000	Richard J. LaPorte	Call processing, messaging, computer/telephone integration
230	231	Verilink	31		1982	(800) 837-4546	Leigh 8elden	Integrated access devices, T-1/E-1 multiplexers, DSU/CSU
231	240	Develcon Electronics	31	150	1974	(800) 667-9333		Local and remote LAN access products
232	218	Data Race	30	185	1983	(210) 263-2000	Dr. W. 8. 8arker	Modems and multiplexers
233		D-Link Systems	30	50	1985	(800) 326-1688	Roger Kao	LAN hardware/software, print servers & remote access
234		Xylan	30	210	1993	(818) 880-3500	Steve Kim	Network management
235	201	UNIFY	29		1984	(408) 467-4500	Reza Mikailli	High-end client/server enterprise and Web development, RD8MS and 4GL
236		BroadBand Technologies	27	333	1988	(919) 544-0015	Salim 8hatia	Fiber-optic data transmission
237		Interlink Computer Sciences	27		1985	(510) 657-9800	Charles W. Jepson	High-performance network transport products/system mgmt. applications
238		PlainTree Systems	27	109	1991	(613) 831-8300	8ruce Walter	Switching products for management of Ethernet/FDDI networks
239	211	NetSoft	26	154	1980	(800) 352-3270	Patrick Linehan	Connectivity solutions for I8M mainframes and AS/400s
240	213	Alantec	25	104	1987	(408) 955-9000	George Archuleta	Intelligent switching hubs for Ethernet and FDDI LANs

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NetworkWorld Executivebriefing

VISIONS FROM TODAY'S LEADING NETWORKING COMPANIES.

continued . . .

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TOP 10 TEN

COMPANIES TO WATCH

TOP TEN

Companies to Watch in 1997

AT&T: We're not just transpo[illegible]ervices anymore

By David Rohde

After Prince Charles and Lady Diana separated and part of Windsor Castle burned to the ground a few years back, Queen Elizabeth II reverted to Latin and dubbed 1992 "annus horibilis" for the British royal family.

For AT&T — the U.S. telecommunications market's royal family — 1996 felt much the same.

The carrier lost its well-known president, Alex Mandl, and replaced him with a printing company executive who nobody in the network industry had heard of. AT&T's consumer market share came under attack from Dime Lady Candace Bergen and no-name discounters. Its chief executive officer was pilloried in news magazines for his outlandish compensation even as the company's stock price fell through the floor. And for all practical purposes, the carrier's entry into the local telephone business was stopped by a federal court.

Despite all this, a curious good humor — sort of like Londoners during the Blitz — pervades the ranks of AT&T product managers and executives responsible for business services going into 1997.

They know the carrier's 1996 increase in frame relay market share (see graphic) will not make the cover of *Newsweek*, but there it is.

The dreaded layoffs of some 40,000 employees never really touched the business data services division. And the carrier has a new trick up its sleeve: The mantra customers will be hearing repeatedly from AT&T in 1997 is "applications, not just transport."

If you haven't already, you can expect to be hearing about the Electronic Commerce Services Transport Platform (ECSTP) from your AT&T representatives. AT&T executives view the ECSTP as their way out of having to make a Hobson's choice between offering transaction services over the public switched telephone network — their traditional meat and potatoes that may ultimately go away — and the tidal wave of Internet commerce.

Through ECSTP, AT&T can offer its customers the choice of doing business with their customers by phone, fax or E-mail — all without installing voice response, fax and Web servers on the premises — and have the AT&T network download the orders to users' databases in a uniformed format.

AT&T's ability to provide integrated electronic commerce offers is particularly important to Gail McGovern, AT&T's executive vice president for business markets. She has even taken to calling straight transport buyers "do-it-yourselfers," with the implication that "turnkey solutions buyers" will become the norm over the next fewyears.

There's good reason for AT&T to emphasize applications over transport in 1997: The company can charge good money for it. Early implementations cost a minimum of 80 cents to $1 a pop, compared to a few pennies per minute for regular long-distance switched services.

"Carriers are migrating to high-margin services because there's so little margin left in ordinary transport," says Jan Hertzberg, a Chicago-based senior manager with the telecommunications consulting practice at Ernst & Young LLP.

And one of the principal techniques for AT&T to buck up its short-term profits — quick-hit price hikes in interstate long-distance tariffs filed with the federal government — will be gone by midyear thanks to a Federal Communications Commission ruling.

Perhaps the biggest question mark for AT&T in 1997, though, is its entry into the local services business. Even if the commission's local competition rules are affirmed by the courts, analysts think the best deals may come from facilities-based local carriers rather than resellers like AT&T.

So while underlings pound away at the applications story, expect the first order of business for new company President John Walter — after effectively responding to the Dime Lady — to be making AT&T's local entry really work. After that Walter will need a plan to counter the potential new combination of a merged MCI Communications Corp. and British Telecommunications plc.

"I was surprised by his appointment, but he does bring some of the discipline and planning that's going to be needed," said longtime AT&T customer Peter Brown, manager of global communications for Cargill, Inc. in Minneapolis. "He's got a huge job ahead of him."

TOP 10 TEN

COMPANIES TO WATCH

AT&T

Headquarters:	Basking Ridge, N.J.
Founded:	1886
1996 revenue:	$51.8 billion*
Primary products:	Wide-area voice and data services; network-based transaction processing; outsourcing Internet access and Web site hosting
Key rivals:	MCI, Sprint and RBOCs

* Estimated

DID YOU KNOW?

Despite spinning off Lucent and NCR, AT&T is still so big and threatening that it's having a hard time finding dance partners. Nearly a year after Congress ordered open all telecom markets, not one RBOC has signed a comprehensive local interconnection agreement with AT&T.

FACT

AT&T holds a 42.2% share of the U.S. frame relay market, up from 39.3% in 1995, but still well below its 55% overall share of long-distance revenue, according to Vertical Systems Group in Dedham, Mass.

Ipsilon carries IP switching torch

By Michael Cooney

If IP switching upstart Ipsilon Networks, Inc. has made one mistake in the past year, it is underestimating the amount of pent-up ill will users have against large routers.

At least that's what Brian NeSmith, president and chief executive officer of Ipsilon, believes.

"The Internet and many large routed backbones are held hostage by these big routers," he says. "And while the numbers of users on these networks continues to grow, routers have largely remained static, causing lots of bottlenecks."

But it may turn out that router kingpin Cisco Systems, Inc. gives Ipsilon its greatest challenge as Ipsilon tries to move its IP switching technology into the network industry mainstream in 1997.

Ipsilon's technology takes the TCP/IP protocol and layers it on top of ATM switching fabrics, letting customers retain management control and use existing TCP/IP applications over a high-speed, high-capacity switched ATM backbone.

Proponents see it as the answer to the bandwidth and performance problems occurring on the Internet and other large router backbones. Detractors say the technology is too TCP/IP-centric and foregoes the quality of service and switch monitoring capabilities of ATM that are needed for larger nets.

While Ipsilon has built up favorable public opinion during 1996, the company clearly needs to establish itself and the technology in some big customer accounts in 1997.

It also needs to adapt to increasing competition by quickly adding features to its IP Switch ATM 1600 box.

"Our focus this year will be to address the two major technology areas our competition says we lack — scalability and multiprotocol capabilities," NeSmith says. "Our other priority will be to continue signing on vendors to use the IP switching technology in their products."

Specifically, NeSmith says the company will add flow control mechanisms that will enable larger numbers of users in big TCP/IP nets to communicate. The company will also add support for IPX and AppleTalk protocols this year, he says.

"The driving idea behind IP switching is to make TCP/IP perform better without changing it," NeSmith says. "Our advanced features will ship way before Cisco has anything out the door."

Cisco will be out the door in early 1997 with products supporting Tag Switching technology, its answer to scaling router backbones.

Like IP switching, Tag Switching specifications have been submitted to the IETF.

Essentially, Cisco declared war on Ipsilon late last year by trying to round up more than 50 vendors to support Tag Switching in their products. Ipsilon responded quickly by announcing it would support Cisco's Interior Gateway Routing Protocol in its IP switching technology — but these are only the first salvos in what likely will be a battle throughout 1997.

"IP switching and Tag Switching are further proof that ATM as a full end-to-end connection mechanism has a long way to go, and until it does, these kinds of technologies will continue to grow," says Anura Guruge, an independent analyst in New Ipswich, N.H.

TOP 10 TEN
COMPANIES TO WATCH

IPSILON NETWORKS

Headquarters:	Palo Alto, Calif.
Founded:	1994
1996 revenue:	Not available (privately held)
Primary product:	IP Switch ATM 1600
Key rival:	Cisco

DID YOU KNOW?

Ipsilon founder Tom Lyon created the ATM Forum's ATM Adaption Layer 5 standard, which has become the basis for most ATM implementations.

FACT

Since its founding, the company says it has raised over $30 million in venture capital.

Marimba gets in tune with real Java needs

By Ellen Messmer

The whole networking world seems obsessed with the Web browser right now. But Kim Polese, founder and chief executive officer of Marimba, Inc., wants you to get rid of your browser if you're into heavy-duty Java applications.

She argues that the Java-based browser is a "constraint" because it won't let you save Java applets to a client machine's disk — and nobody wants to repeatedly download large amounts of code.

So Polese and her Java-lovin' pals at Marimba recently came up with Castanet, a product for deploying applications so changes are delivered automatically as an upgrade to Castanet's Java client software. Castanet uses a bandwidth-saving technology called the Application Distribution Protocol.

This attempt to free Java from its browser corset comes from the very team that helped launch Java in the first place at Sun Microsystems, Inc. after guru-in-residence James Gosling cooked up the programming language.

"By the end of '95, Java had hit it big," says Polese, then Sun's product manager for C++. Before long, she was thinking of striking out on her own to take advantage of what she sensed would be a rising demand for innovative Java products that broke the browser mold.

Over the holiday season that year, she spoke with two other Sun engineers about setting up a new company.

There was no shortage of venture capital for Java start-ups, and by mid-1996, the three Sun refugees had started Marimba with former Sun engineer Sami Shaio.

Things have progressed swiftly since then. Marimba's first product, Castanet, entered beta testing in October at customer sites such as Walt Disney Co., AT&T and United Media.

Marimba's staff is at 18 people, mostly engineers, and growing. Polese does not discount the possibility that Marimba could make an initial public offering in 1997.

However, some analysts caution that Marimba faces an uphill battle. "What they've done is useful, but it's middleware, and few middleware companies survive," says John Rymer, vice president at Cambridge, Mass.-based research firm Giga Information Group. "At this point, they're dependent on a few large customers. It's difficult to make a transition to [becoming] a software company making money off licenses."

TOP 10 TEN
COMPANIES TO WATCH

MARIMBA

Headquarters:	Palo Alto, Calif.
Founded:	Mid-1996
1996 revenue:	Not disclosed (privately held)
Primary product:	Castanet tool set for deploying Java applications
Key rival:	Intermind

DID YOU KNOW?

Marimba founder Kim Polese, formerly with Sun Microsystems, takes credit for giving the "write once, run anywhere" programming language its name, Java.

FACT

According to Forrester Research in Cambridge, Mass., 62% of Fortune 1,000 companies with Internet initiatives are already using Java, and 42% said Java will be key to their Internet computing strategies within a year.

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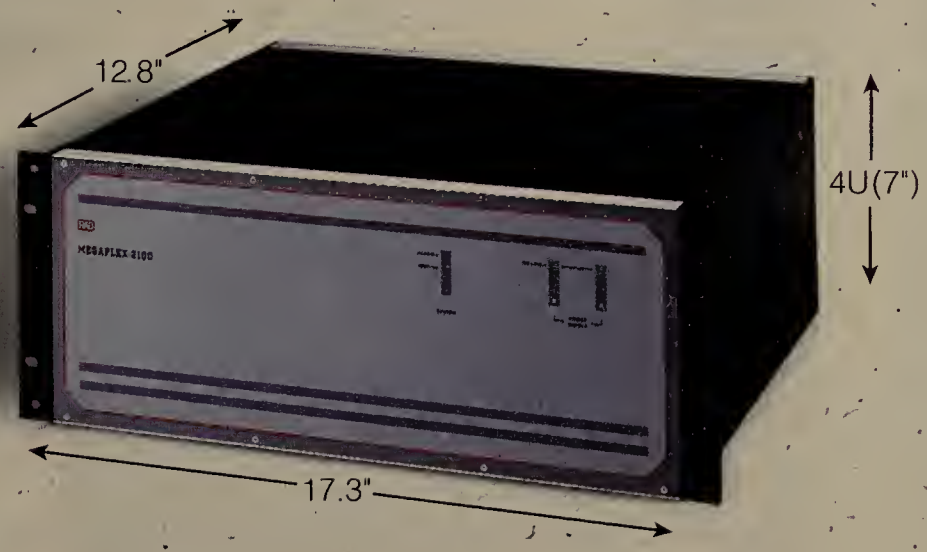

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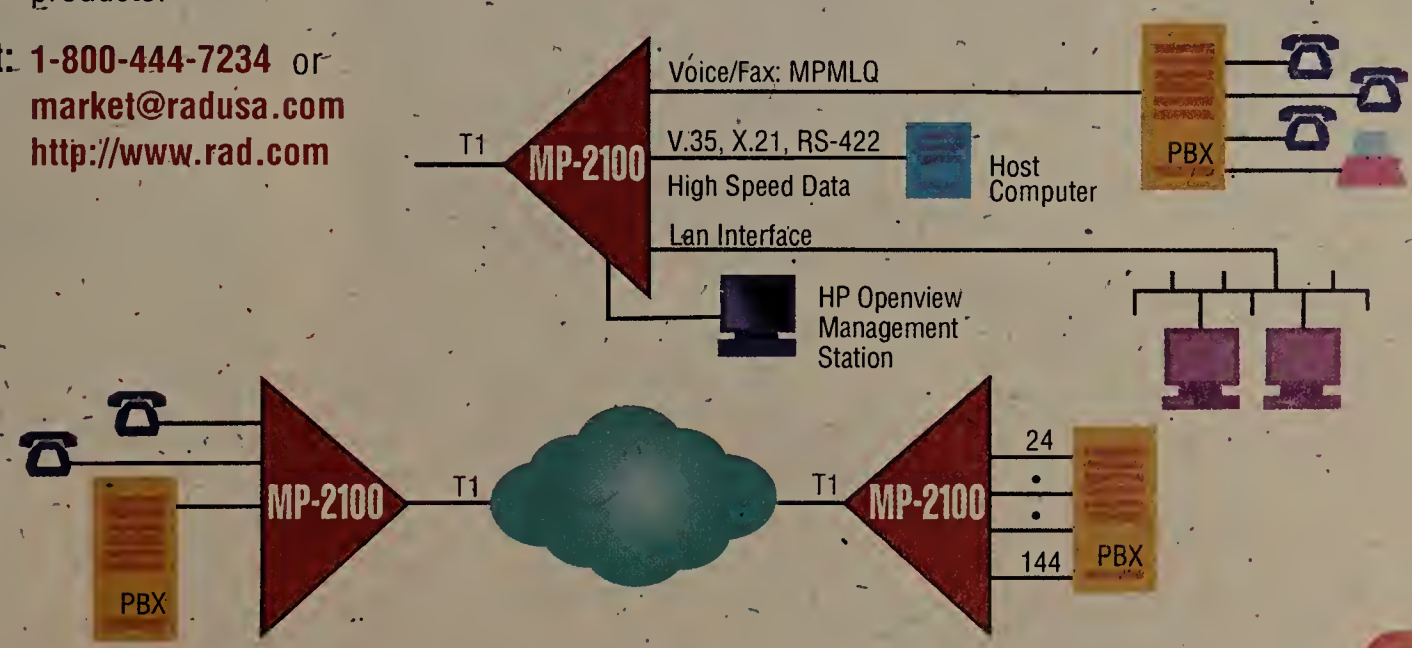

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TOP 10 TEN

COMPANIES TO WATCH

MFS WorldCom needs merger to score big

By Tim Greene

When you think of basketball legend Michael Jordan's skills, telecommunications acumen probably doesn't come to mind.

But that has not stopped the playmaker for the four-time world champion Chicago Bulls from signing on to promote WorldCom, Inc., the fourth-largest U.S. long-haul carrier that will soon become MFS WorldCom upon completion of its MFS Communications Company, Inc. acquisition.

And if you think about it, there is a legitimate parallel between Jordan and the $3.6 billion carrier: Jordan does it all on the court, while MFS WorldCom is trying to do it all in the telecommunications market.

MFS WorldCom's desire is not unrealistic. The company has an impressive array of assets, including the only wholly owned local, long-distance and international all-fiber network, as well as its UUNET Technologies, Inc. Internet holdings. MFS WorldCom is a player to be reckoned with if it can pull everything together.

Bernard Ebbers, president and chief executive officer of WorldCom, says the company will wring cost savings out of the merger by streamlining overlapping plans the companies had for expanding their networks.

Plus, with MFS having interconnection agreements already in place with three regional Bell operating companies, it is poised to enter the switched local dial-tone market.

Ebbers' game plan is to offer "a unique combination of local, long-distance and international calling and Internet-based services."

MFS is in the throes of absorbing its most recent purchase, UUNET, the Internet access giant that caters to corporate users. Over the past two years, WorldCom has also been in an acquiring mood, pulling in WilTel and its nationwide fiber network, wireless reseller Choice Cellular and prepaid calling card vendor BLT Technologies.

All those additions have not come without bumps, according to Eric Paulak, an analyst with Gartner Group, Inc. in Stamford, Conn. For example, it took two years after LDDS Communications, Inc. bought WilTel in 1994 and formed WorldCom for the new company to get its services coordinated. "There was no integrated support," Paulak says.

And now WorldCom has to add MFS, which owns fiber networks in 45 North American cities and just bought into an undersea cable that will give it as much trans-Atlantic capacity as AT&T.

MFS WorldCom is in a particularly good position to pull its grand plan off successfully, but the carrier also has to be quick about it since so many other companies are targeting the same markets.

Perhaps Michael Jordan can give the carrier some tips on how to run a fast break.

TOP 10 TEN

COMPANIES TO WATCH

MFS WORLDCOM

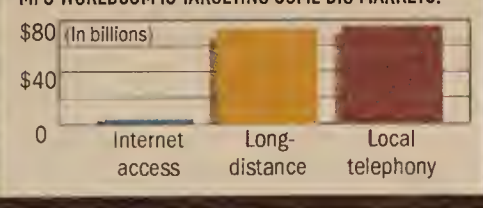
Headquarters:	MFS – Omaha, Neb. WorldCom – Jackson, Miss.
Founded:	MFS – 1987 WorldCom – 1983
1996 revenue:	MFS – $583 million WorldCom – $3.64 billion
Primary products:	MFS – Competitive phone and Internet access design, installation and management of fiber networks WorldCom – Domestic and international voice, data and video services
Key rivals:	Local carriers

DID YOU KNOW?

Back up the corporate family tree, a WorldCom ancestor laid the first trans-Atlantic cable in 1879.

FACT

MFS WORLDCOM IS TARGETING SOME BIG MARKETS.



Network Appliance plans to keep it plain and simple

By John Robinson

As a home appliance, the toaster is expected to perform a specific task and perform it well — nothing more, nothing less. When you put bread in the slot, you don't expect lasagna to pop out.

Network Appliance, Inc. (NetApp), as the company's name implies, manufactures products designed with the same ease-of-use features, simplicity and dependability expected in a home appliance — no lasagna.

NetApp, based in Mountain View, Calif., makes dedicated file servers, or what it calls filers, based on Network File System (NFS) and company-developed software for high-speed data access. The devices are designed for file management and, hence, increase access speeds for storing and retrieving data over Ethernet rather than on local hard disks. With Pentium processors and an integrated RAID controller, they are considered by NetApp to be the equivalent of powerful refrigerator-freezers for data storage.

"The thing that most people can't believe is you get faster access to data from [the filer] than you do from the desktop," says Charlie Simmons, vice president of marketing for NetApp. "We can make them faster, we can make them hold more data, make them easier to manage and simple to use."

Because of their simplified workloads, these servers are stripped of symmetric multiprocessing, graphical user interfaces and APIs, leaving more room for power and storage.

NetApp's "simple is better" philosophy is beginning to take hold among customers. The company has shipped close to 1,500 filers to date. Since 1994, company revenue has increased more than 20-fold — from $2 million to $46.6 million in fiscal 1996.

However, the company is not basking in its financial successes. Instead, it is working to decrease the complexity of networks and increase interest in open standards for storage.

NetApp and Peripheral Devices Corp. recently developed the Network Data Management Protocol, which, through universal agents, is designed to eliminate the need for vendors to port their data management software to different combinations of file servers and storage devices. The protocol is being reviewed by the Internet Engineering Task Force.

NetApp is also keeping a watchful eye on the war between network computer (NC) advocates and staunch desktop supporters. Since both groups depend on data stores, NetApp is well positioned. However, Simmons points to NC interest as another example of industry support for slimming down network components, and NetApp counts on that support.

In addition, NetApp is working with Microsoft Corp. to promote Common Internet File System (CIFS) — the NFS protocol for Windows and Windows NT — as an open industry standard and to develop a multiprotocol CIFS/NFS filer.

The company admits its products are not exotic devices due to their simplicity. But NetApp officials hope network decision makers will realize that for every job there is an appropriate appliance.

TOP 10 TEN

COMPANIES TO WATCH

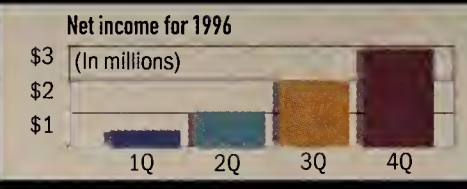
NETWORK APPLIANCE

Headquarters:	Mountain View, Calif.
Founded:	April 1992
1996 revenue:	$46.6 million
Primary products:	Dedicated file servers
Key rival:	Sun Microsystems

DID YOU KNOW?

Dan Warmenhoven, president, CEO and director, used to be chairman, president and CEO of Network Equipment Technologies.

FACT



The Precept principle: Run video over nets

By Barb Cole

Why install ATM, Fast Ethernet or new routers to pump out multimedia traffic when you can use software to squeeze it through existing nets?

That's the question Precept Software, Inc. is putting to network managers looking to enhance their intranets with video, audio and images.

The company was launched in 1995, and in 1996 announced a set of products that let customers push multimedia traffic to Windows desktops over existing IP-based Ethernet and FDDI networks. Precept's products also support, but do not require, new high-bandwidth technologies such as Fast Ethernet and ATM.

The company's concept has caught the attention of venture capitalists, market analysts and some early adopters. Precept's cofounders — the husband-and-wife team of Bill Carrico and Judy Estrin — are known to be a step ahead of the market, given that they already have two successful start-ups to their credit.

"Our timing is very appropriate," says Estrin, Precept's chief executive officer. "A lot of customers are realizing that the technology [to run video over a data network] is finally here and are looking at deployment plans."

Unlike some proprietary desktop video technologies, Precept's software is based on an IETF standard, dubbed Real-time Transport Protocol, for streaming data over IP nets. A related Real-time Transport Control Protocol standard, which scopes out the most efficient network route, could gel as an IETF standard in 1997.

Also on Precept's side is its software's

See **Precept,** *page 28*

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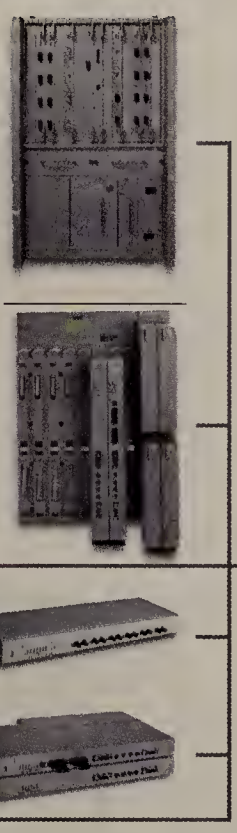

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TOP 10 TEN

COMPANIES TO WATCH

Rapid City makes break for Gigabit Ethernet mart

By Jodi Cohen

Think fast. Rapid City Communications sure does.

The privately held start-up is getting ready to attack what will surely become one of the hottest markets of the new year: Gigabit Ethernet switching.

The company in early 1997 will introduce a line of 1G bit/sec Ethernet switches that will be used primarily for high-speed backbone links between switches, hubs and routers. Rapid City is just one of many early entrants in the emerging Gigabit Ethernet market, and industry observers have been reluctant to peg a front-runner in this arena. Still, Rapid City seems to stand out, analysts say.

"Rapid City is developing switches with pretty sizable backplanes that will be able to handle multiple Gigabit Ethernet links," says Esmerelda Silva, an analyst at International Data Corp., a market research firm in Framingham, Mass. "I'm wondering whether a lot of other vendors' products will have enough switching capacity to make use of Gigabit Ethernet without becoming oversubscribed."

Other features include Layer 3 switching and multimedia support. The firm plans to let its switches handle 'Net protocols — like Real-Time Transport Protocol and Resource Reservation Protocol — so the switches can prioritize time-sensitive voice and video data across the network.

But Rapid City's success may have less to do with features than with timing.

"Our biggest challenge is getting product out the door on time," says Joe Kennedy, president and chief executive officer. "We've got to be among the first cluster of companies to ship."

The firm plans to roll out its first products — the Intranet Switch family of Gigabit Ethernet switches — next spring.

Other challenges Rapid City faces include fierce competition — from start-ups and internetworking giants — and the lack of a Gigabit Ethernet standard.

"You'll see companies like Cisco [Systems, Inc.] wait until the standard is complete in 1998 to roll out Gigabit Ethernet gear," Silva says. "But companies like Rapid City need to jump out ahead and deliver prestandard product to get noticed. Otherwise, once the big guys deliver their Gigabit Ethernet switches, smaller players like Rapid City will have a hard time competing."

TOP 10 TEN

COMPANIES TO WATCH

RAPID CITY COMMUNICATIONS

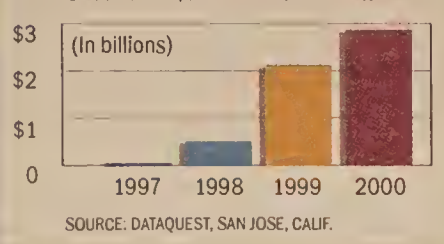
Headquarters:	Mountain View, Calif.
Founded:	April 6, 1996
1996 revenue:	None
Primary products:	Layer 3 Gigabit Ethernet switches
Key rivals:	Gigabit Ethernet start-ups such as Prominet and Extreme Networks, as well as larger players including Cisco

DID YOU KNOW?

Company President and Chief Executive Officer Joe Kennedy has received more than a few phone calls from religious leaders and politicians mistaking him for the Massachusetts congressman.

FACT

THE GIGABIT ETHERNET MARKET IS EXPECTED TO APPROACH $3 BILLION BY THE YEAR 2000.



SOURCE: DATAQUEST, SAN JOSE, CALIF.

Sanga pours its energy into Java apps

By Carol Sliwa

Most of the customers ordering Big Macs and fries on March 31 at McDonald's in Burlington, Mass., probably had no idea that the formation of a new company called Sanga International, Ltd. was taking shape in their midst.

Twin brothers Shane and Shaun Maine, and former Lotus Development Corp. engineer Mark Lussier, were gobbling down their fast food just like the rest of the crowd, only the Java they were pondering had nothing to do with McDonald's piping hot coffee.

Their grand plan? To create a Lotus Notes-like development environment using the hot new Java programming language. Millions and millions to be served? They certainly hoped so.

While Java may not have been used for meaningful business applications to that point, the trio is banking that it will be. Sanga's platform-independent software is designed to take advantage of the Web-based Java Database Connectivity standard to access corporate information.

The company sells client/server software, data access tools, a form design package and scripting language. Customers do the customization work to create applications to suit their needs.

"If a company is going to start creating meaningful Java applications that access multiple data sources, then the infrastructure becomes complex and the programmers will need tools that help them manage that complexity," says Tim Sloane, director of Internet research with the Boston-based Aberdeen Group, Inc. "They'll need environments like Sanga."

If Sanga's growth rate surges next year, that could indicate developers are moving commercial applications to Java.

"We're very fortunate to be first in this space, and we're going to leverage the heck out of that," promises 28-year-old Shane Maine, Sanga's Canadian-born chief executive officer who heads the company with brother Shaun, vice president of technology. "One of our sales guys always says, 'I never remembered who the second guy on the moon was.'"

Last June, Sanga incorporated with just five employees in tow. By the end of October, Sanga had cracked the 40-employee mark. Corporate-friendly Barbados is home to the parent company.

A defining moment for the company came last August, when Sanga's brain trust visited Java developer Sun Microsystems, Inc. In Shane's words, Sanga showed off a suite of applications that were "far beyond" what Sun's JavaSoft division was running.

Sun has since helped take Sanga from "a small company without much visibility into the forefront," he says.

TOP 10 TEN

COMPANIES TO WATCH

SANGA INTERNATIONAL

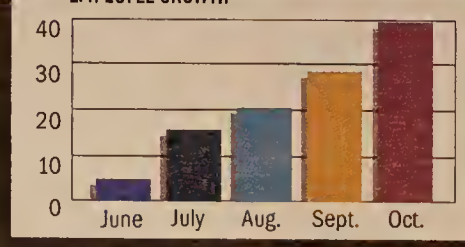
Headquarters:	Parent company — Bridgetown, Barbados U.S. sales subsidiary — Burlington, Mass.
Founded:	June 1996
1996 revenue:	Not available (privately held)
Primary product:	Sanga Pages, a Java application suite that includes a drag-and-drop tool and a BASIC-like scripting language for linking applications to any data source
Key rivals:	None in Java environment right now; other environments — Lotus, TVObjects, HAHT Software and Radnet

DID YOU KNOW?

CEO Shane Maine and Vice President of Technology Shaun Maine are identical twin brothers who grew up in Guelph, Ontario.

FACT

EMPLOYEE GROWTH



TOP 10 TEN

COMPANIES TO WATCH

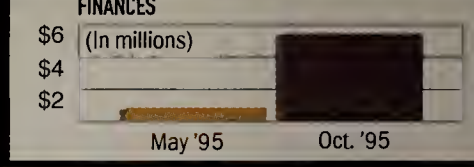
PRECEPT SOFTWARE

Headquarters:	Palo Alto, Calif.
Founded:	1995
1996 revenue:	Not available (privately held)
Primary products:	FlashWare and IP/TV multimedia and multitasking software
Key rivals:	Xing Technologies and Starburst Communications

DID YOU KNOW?

Precept cofounders Judy Estrin and Bill Carrico have two successful start-ups under their belts. The husband-and-wife team founded Bridge Communications in 1981, and later joined the fledgling Network Computing Devices.

FACT



Precept

Continued from page 26

ability to adapt to existing networks.

"Precept's software scales across a large [range] of bandwidth," says Clay Rider, director at Zona Research, a market research firm in Redwood City, Calif. Others in this category are optimized for dial-in mode or ISDN networks, he says.

Hewlett-Packard Co. used Precept's software to transmit a profit-sharing speech to about 300 employees' desktops recently. Stanford University is expected to use it to broadcast courses, speeches, and other programs across campus and into the community.

"We looked at a lot of products, and what impressed us about Precept's stuff was that we didn't have to install any special hardware on our PCs to enable video to the desktop," says Tim Delamart, an information technology engineer at HP.

Through 1996, Precept was still largely in development and ramp-up mode, Estrin says. However, the company struck significant relationships with Netscape Communications Corp. and Cisco Systems, Inc. Netscape is using some of Precept's technology in its LiveMedia framework for Internet multimedia, and Cisco signed on to resell Precept's wares and invested in the company.

The challenge for 1997 is to continue to educate the market about how to effectively use video in the enterprise. To that end, Estrin has spearheaded the formation of The IP Multicast Initiative, an industry group made up of 20 charter members in the IP multicast space.

Cole is a former senior editor with Network World.

VocalTec hopes to make itself heard in business market

By Chris Nerney

Most technology companies only dream of being identified with the kind of "killer app" that put VocalTec, Ltd. on the map when it released the Internet Phone in February 1995.

For the first time, PC users with a sound card, microphone and Internet connection could talk to similarly equipped users anywhere in the world for the price of a local modem dial-up call.

The Internet Phone instantly created an industry buzz — criticisms of poor sound quality notwithstanding — and VocalTec grabbed more than 90% of the fledgling Internet telephony market. It also caught the attention of phone companies that, facing the prospect of competing with free long-distance service, asked the Federal Communications Commission to regulate Internet telephony.

TOP 10 TEN

COMPANIES TO WATCH

VOCALTEC

Headquarters: Herzeliyya, Israel (subsidiary in Northvale, N.J.)
Founded: 1989
1996 revenue: $5.48 million*
Primary products: Internet Phone, Internet Telephony Gateway, Internet Conference Professional and Internet Voice Mail
Key rivals: Netscape, Microsoft, Intel and Quarterdeck

*First three quarters

DID YOU KNOW?

Before joining VocalTec in 1990, CEO Elon Ganor founded a Swiss-based biotechnology company. Ganor is a trained cardiologist.

FACT

The Internet telephony market could grow from 500,000 users and $3.5 million in revenue in 1995 to 16 million users and $560 million in revenue by 1999, according to International Data Corp.

Now, Chief Executive Officer Elon Ganor says the Israel-based firm must change "the perception by some people that VocalTec is a one-product company.

"We are shifting very quickly to be more oriented toward the business market than the consumer market, which was our plan since day one," he says. "We are software providers for the telecommunications business."

Ganor points to the recent success of three new business products: the Telephony Gateway Server; the Internet Conference Professional; and Internet Voice Mail.

The Internet Phone was responsible for 98% of VocalTec's revenue in the first two quarters of 1996, according to Ganor.

In the third quarter, however, there was a dramatic shift. "Only 52% of revenue came from the Internet Phone, and 48% came from the three business products," Ganor says.

The announcement in late October of third-quarter sales distribution immediately gave VocalTec's stock a 16% boost — something it needed after dropping to about $4 per share from close to $20 per share at its February IPO.

"That reaction proves that the breakdown of revenue based on product is important to the market, and we're making that shift," Ganor says.

Eric Paulak, an analyst at Gartner Group, Inc., says VocalTec's survival hinges on its developing and marketing products for businesses. "Internet telephony has possibilities, but not today," Paulak says. "[VocalTec] needs to be stressing what it can do for other businesses. Not in the future, but today."

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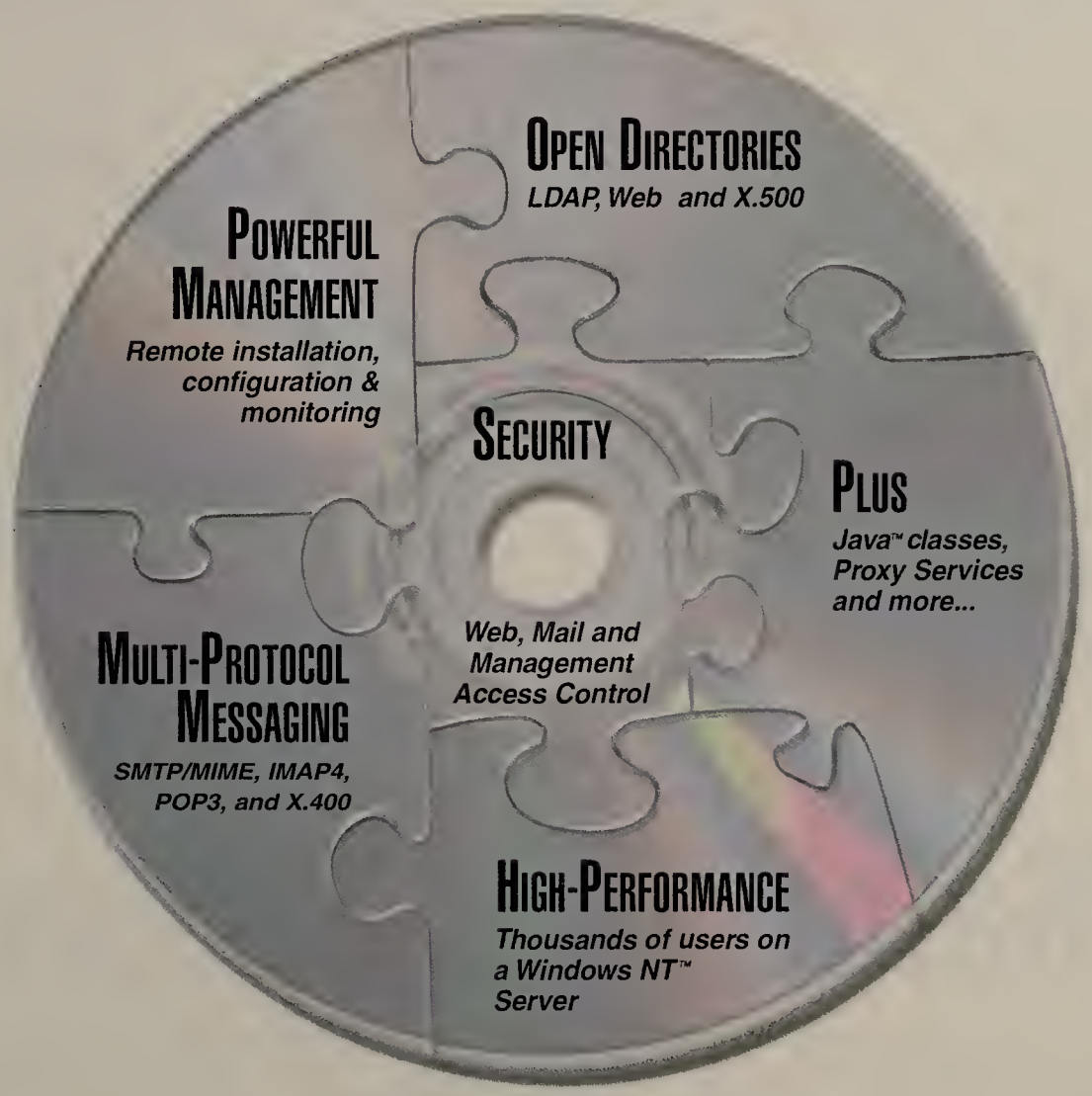

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Circle Reader Service #17

Zoomit gets diplomatic on directories

By Christine Burns

Diplomacy is going to be Zoomit Corp.'s game plan for 1997.

The small Toronto-based company's goal is to get all the warring directories that exist throughout corporate intranets to work together.

According to Kim Cameron, Zoomit's chief scientist and vice president of technology, the company plans to "democratize directories" by taking away the unnecessary assumption that the world must revolve around a single directory.

"We have a multicentered view of the world, and that is what is driving us forward so quickly," he says. "We don't wipe out the different directory constituencies existing in companies today. Instead, we enable them all to contribute to the common cause of organizing the intranet."

Zoomit, a company that historically shipped directory synchronization tools for large Banyan Systems, Inc. VINES accounts, has already delivered the technology that will help it accomplish this new diplomatic feat. Zoomit Meta-Directory hit the street in late November.

The Meta-Directory comprises a database engine that sits on one or more distributed Windows NT Server machines, and agent software that resides in any participating directory service on the intranet.

TOP 10 TEN
COMPANIES TO WATCH

ZOOMIT

Headquarters:	Development – Toronto Sales – Vienna, Va.
Founded:	1988
1996 revenue:	Not available (privately held)
Primary products:	Zoomit Meta-Directory
Key rivals:	Worldtalk and Novell

DID YOU KNOW?

The company likens its directory product to the Mississippi River because of all the different tributaries that join in it.

FACT

The company estimates it will tie together an average of five disparate directories per customer site.

To date, the agents provide hooks to Novell, Inc. NetWare 3.X and 4.X, Lotus Development Corp. Notes and cc:Mail, Microsoft Corp. Exchange and Windows NT Domain Service, VINES, Lightweight Directory Access Protocol-based services and others. The product ships with a tool kit that lets developers build agents for custom directory services.

"Zoomit's advantage here is its independence," says Rob Enderle, an analyst with Giga Information Group in Santa Clara, Calif. "They haven't directly aligned themselves with any single player in this directory game. That makes their story more believable."

Cameron says the toughest challenge for Zoomit in coming months will be making potential customers understand that the Meta-Directory is completely different than what he calls a Yeta-Directory (Yet Another Directory).

"Corporations today already maintain an average of five directory services. If we try to tell them that we have yet another new directory, those administrators are going to get all agitated," he says.

Making this distinction could be a daunting task for a company with a workforce of only 35 people.

But Cameron says Zoomit's workforce is doubling in size every six months, and the company is lining up a series of good resellers and partners.

He Must Be Talking About

Clinton Eyes "Legacy" Issues

President Clinton plans to take on two incendiary political

- USA TODAY

Browser-Based Mainframe Access

Hail to the Chief! If the President of the United States is looking into it – it must be important. Browser-based access to "legacy" systems makes existing applications and data more widely available to internal customers over intranets, and extends this infrastructure to customers, distribution channels, and business partners over the Internet.

The advantages of integrating host information using OpenConnect's new SNA Web co-processing technology, OC://WebConnect™, and its companion integrated development environment, OpenVista™, have become very compelling. OpenConnect Systems' browser-based host access increases the value and the availability of SNA mainframe and midrange applications and data without sacrificing SNA network performance, management or security.

Using OpenVista, you can rejuvenate host applications with graphical user interfaces and offer them to a whole new class of users with less training, and little or no distribution costs. You'll reduce network bandwidth utilization, without modifying the existing host application.

To learn how you can make the move to browser-based access for your mainframe, call for your free white paper which outlines the business benefits of browser-based host access and rejuvenating your mainframe applications. Doing so will make you appear very presidential.

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Circle Reader Service #7

HOW FORE ATM *Helped* DREAMWORKS *Animate* ITS SUCCESS.

"If an artist has to stop and wait for an electronic process, work slows down, and that's deadly on a movie."

That's Bill Villarreal, co-head of technology at Dreamworks SKG, explaining the challenges of applying cutting-edge technology to traditional hand-crafted animation. Dreamworks is currently producing its first animated feature, "Prince of Egypt," and Villarreal needed a high performance multi-service network that would connect the team of directors, animators, layout artists and producers on the picture.

Bill Villarreal
Co-Head of Technology
Dreamworks SKG

"Once we decided on ATM, we looked at various vendors, and FORE had the most extensive experience. Their support and commitment to ATM were well known in the industry."

Among the countless advantages of FORE ATM for Dreamworks was "the ability to reserve bandwidth over the system so we could deliver JPEG video streams, enabling our artists to track the current state of the movie. It also means that Jeffrey Katzenberg can call it up on his desktop and monitor the film's progress."

"The impact of FORE ATM is better collaboration, greater creativity and a faster approval cycle.
As far as facilitating the process, FORE has been incredible."

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Circle Reader Service #15

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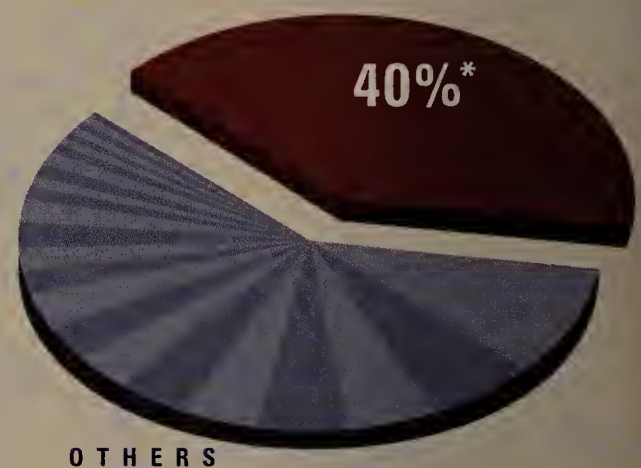

**Source: IDC, 1996*

TECHNOLOGY LEADER

CHECK POINT *FireWall-1* continues to receive top honors from the industry's toughest reviewers and product testers. At Networld+Interop Atlanta '96, *FireWall-1* was selected as both the best Internet and best Intranet firewall. Most recently, *FireWall-1 3.0* was awarded Best of Show Grand Prize Winner at Networld+Interop Paris '96.

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The 25 MOST POWERFUL PEOPLE in Networking

power \ˈpau̇(-ə)r\ ***n*** **1:** the ability or capacity to act or perform effectively **2:** a specific capacity, faculty or aptitude **3:** strength or force capable of being exerted; might **4:** ability or capacity to exercise control; authority

Power. It has many meanings. It has many interpretations. It has many practitioners.

Power. To define it is to be in awe of it. To measure it is to be envious of it. To admire it is to want it.

Power. Each of its four definitions can be applied to the networking industry and to this year's roster of Power Players.

Consider the first definition. The following pages will give you 25 superb examples of people who've acted or performed effectively over the past year.

Ditto for the second definition. The people chosen this year display a remarkable range of talents and skills — specific expertise that is shaping networking as we know it in the waning days of the 20th century.

The third definition narrows things a bit. Though all on our list excel, not all exert force or might equally. And they exert it in different ways.

James Barksdale exerts force on the Internet market. Jeff Marshall exerts force on product development. Fred Baker exerts force on standards definition. Tim Kuhfuss, Tim Berners-Lee and Dennis Jones exert force over the application of technology.

The fourth definition narrows the field even more. Gates is the voice of authority in desktop computing, John Chambers in the internetworking industry. Andy Grove dictates how powerful personal computers will be. Reed Hundt controls the airwaves.

Power.

Herein is our lineup of power hitters for 1997. It's an all-star team, the best picks from the customer and vendor communities, and other key segments of the network business. These are the folks who throw the curve balls, hit the home runs and break the game open. They are the networking industry's source of . . .

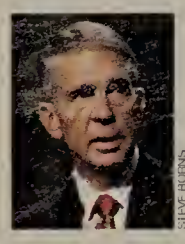
Power.

ROBERT ALLEN

Chairman, CEO, AT&T

Bob Allen isn't likely to pick 1996 as his favorite year.

The year was one of setbacks in which the seasoned telecom veteran really had to earn his mega-pay — which became a cause célèbre itself, with Allen serving as whipping boy for the CEO ranks after announcing plans to lay off tens of thousands of workers.


STEVE BURNS

In August, Allen was rocked by the departure of heir apparent Alex Mandl. Allen's choice of successor, little-known John Walter of printing giant R.R. Donnelley & Sons Co., was met with blank stares by some analysts and harsh criticism by others. AT&T saw its consumer market continue to erode, its stock languished, and it got a black eye trying to deal with the huge influx of new customers to its Internet service.

Perhaps even scarier, the industry became more hostile. Big mergers — such as the planned BT/MCI marriage, WorldCom's buyout of MFS Communications, and the pairings of RBOCs such as NYNEX and Bell Atlantic — could make it difficult for AT&T to keep customers tied to Ma Bell's apron strings.

But consider the fundamentals. AT&T still stands astride the globe as a telecom colossus. Even the combined BT/MCI, which faces daunting challenges of its own, will not be as powerful. AT&T's hold over the lucrative business services market remains tight, and — early problems aside — AT&T has quickly become one of the top Internet service providers.

Perhaps more impressive, Allen pulled off the difficult trick of dividing AT&T into three companies. With equipment spin-off Lucent Technologies, Inc. and computer maker NCR Corp. out of the nest, the service-focused AT&T remains the king to knock off the hill.

FRED BAKER

Chairperson, IETF; senior software engineer, Cisco Systems, Inc.

Fred Baker may be the guy who determines whether you have to spend megabucks to replace your router internet with an ATM network.

As chairperson of the Internet Engineering Task Force, Baker oversees the definition of the Integrated Services Architecture (ISA), a blueprint for enabling IP networks to handle delay-sensitive multimedia applications. ISA permits networks to provide quality-of-service transport through advanced congestion management and queueing algorithms, and the Resource Reservation Protocol (RSVP).

With these capabilities, ISA lets IP networks handle real-time applications such as voice and video. And it could save users the time and expense of ripping out their router infrastructures and replacing them with unfamiliar ATM nets.

Baker sets the agenda for the IETF's work on ISA. He may be uniquely qualified for this role, considering he also helps set the software engineering agenda for Cisco, the dominant supplier of router networks.

At Cisco, Baker's area of expertise is congestion management for support of best-effort and real-time traffic — a tall order given Cisco owns at least 70% of the router market.

In addition to spearheading ISA within the IETF, Baker also contributes to the organization's network management, routing, PPP and frame relay activities.

He can also handle a stat mux or terminal server. So if you're worried about putting multimedia applications on an IP net, Fred Baker is the man to see.

ERIC BENHAMOU

Chairman, president and CEO, 3Com Corp.

Eric Benhamou makes the list for the third year in a row as the leader of the only company, according to many, that can give Cisco a credible run for the internetworking money.

After bowing out of the NOS and workgroup software business in 1991, Benhamou had 3Com focus on its traditional adapter, hub and connectivity hardware line. But now it's time to broaden again, and Benhamou's 3Com is doing so with fervor.

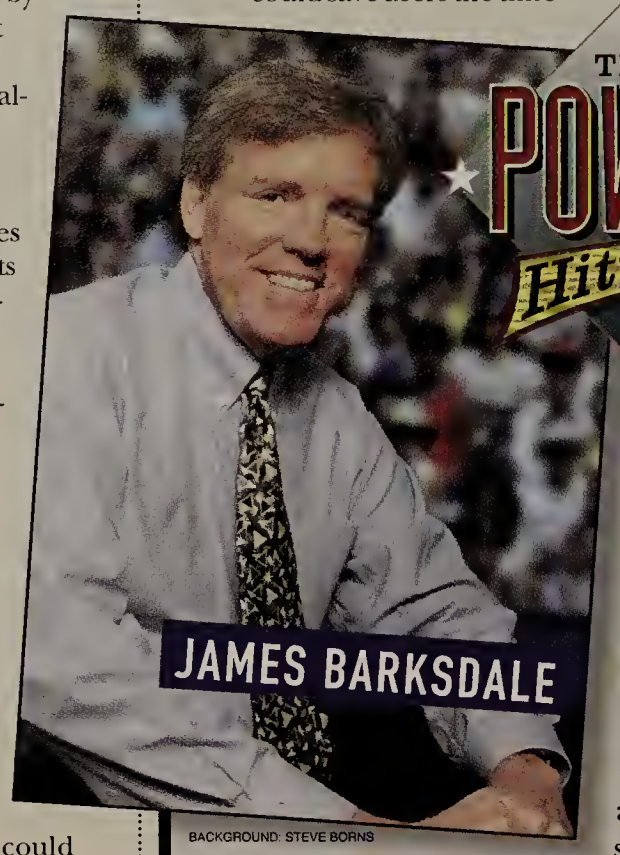
3Com is now going after the WAN, remote access, Internet, intranet and ATM cell switching markets with the same urgency that made it the leading network adapter supplier.

Benhamou is also steering 3Com back toward software — specifically, network management software. Providing comprehensive quality of service (QoS) and VLAN management software adds value to user networks and to 3Com's hardware, Benhamou says.

3Com is also establishing new price/performance standards for switches. And the company planted its stake in remote access with its OfficeConnect line of hubs, routers, and print and fax servers.

Benhamou was instrumental in bringing 3Com together with IBM and Bay Networks to form the Network Interoperability Alliance (NIA), a consortium to accelerate the implementation and development of standards for bringing QoS to networked desktops.

The NIA is intended to thwart Cisco's momentum if Benhamou cannot bring 3Com to do that alone.


BACKGROUND: STEVE BURNS

THE POWER Hitters

Bringing up Netscape

He is, in his own words, the "adult supervision" for the most celebrated offspring of the Internet. And, as any parent knows, raising a child is a demanding job — especially when the child is in the midst of an incredible growth spurt and the big kid down the block wants to do it bodily harm.

The glow has faded from the initial public offering; the press and analysts are critical; and Microsoft is intent on stomping on the little darling of the Internet. These days, Netscape sorely needs the steady hand and seasoned management skills Barksdale brings to the game. He is, as venture maven John Doerr of Kleiner Perkins Caufield & Byers described him, the "gold standard" of start-up CEOs.

Netscape has made Barksdale wealthier — at least on paper — than most mere mortals dare to dream, but he's earning every penny. He's helping Netscape deal with hypergrowth internally, fighting off the challenges of Bill Gates, Scott McNealy and a host of other ravenous competitors, and representing Netscape publicly before buyers, analysts and everyone else who wants to know the Netscape story.

These days, Barksdale is trying to divert all those inquiring minds from the overhyped browser war and get everyone focused on Netscape's intranet efforts. The company is expanding its arsenal of development, collaboration and electronic commerce offerings in an effort to secure a stronghold in corporate IS shops. That's turf Barksdale knows well, having been CIO of Federal Express Corp., one of the most innovative technology users.

Barksdale's experience tells him all the talk about Microsoft vs. Netscape is just the hype du jour. And he'll need every ounce of that experience if Netscape is going to achieve its rich promise.

PLAYER STATS:

Name: James Barksdale
Age: 53
Position: President, CEO
Team: Netscape Communications Corp.

POWER FACTS:

Soft-spoken but wily Barksdale is no stranger to the world of corporate networking, having served as CIO of Federal Express Corp. While there, he claims to have "bought and implemented more software than any CEO of any software company in the world — more than Bill Gates, or Larry Ellison or Scott McNealy."

On the one hand, you need cable.

On the other hand, it better be

reliable.

Need a hand?

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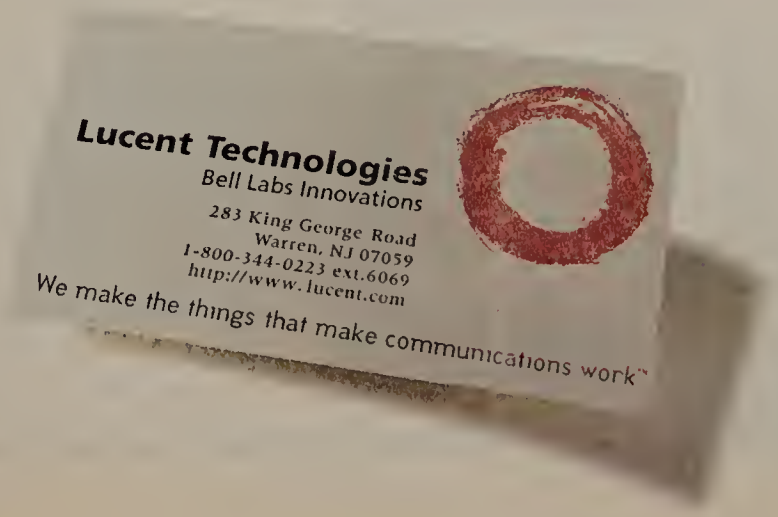

*Circle Reader Service #**18***

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ERIC COOPER

Chairman, CEO, FORE Systems, Inc.

This year was arguably the most challenging ever for FORE and its visionary founder, Eric Cooper.

In the past 12 months, ATM underwent more exhaustive scrutiny than in any other period in its hype-laden history. Some powerful alternatives to ATM emerged this year, all utilizing the packet-based infrastructure and applications people have been using for a decade: Gigabit Ethernet, IP Switching and Cells in Frames.

At one of the leading conferences dedicated to ATM, the consensus was that LAN switching is clobbering ATM at the desktop and the workgroup. The business case for migrating packet- and frame-based infrastructures to ATM for the quality-of-service attributes it supposedly guarantees was rapidly eroding in 1996.

This could not be a good sign for FORE, a company betting *its* business on the hope that you bet *your* business on ATM. Yet the company forged ahead.

Amid all the naysaying, FORE continued to grow. Revenue for the second quarter of fiscal 1997, ended Sept. 30, totaled $98 million, an increase of 88% from the previous year's second fiscal quarter. Net income was $13.4 million, or $.14 per share, an increase of 98% from the second quarter of fiscal 1996.

FORE is the only stand-alone company showing consistent growth in the ATM market, an indication of Cooper's strength of vision and leadership.

And though the industry could barely detect a heartbeat for ATM-to-the-desktop, FORE announced plans to ship 25M bit/sec ATM switches and network interface cards for that very application. At the same time, FORE joined the Gigabit Ethernet Alliance — some say to figure out a way to kill the technology — and participated in a demonstration of IP Switching at NetWorld+ Interop.

Is this a case of FORE throwing up its hands in a "If you can't beat 'em . . ." gesture? Not likely.

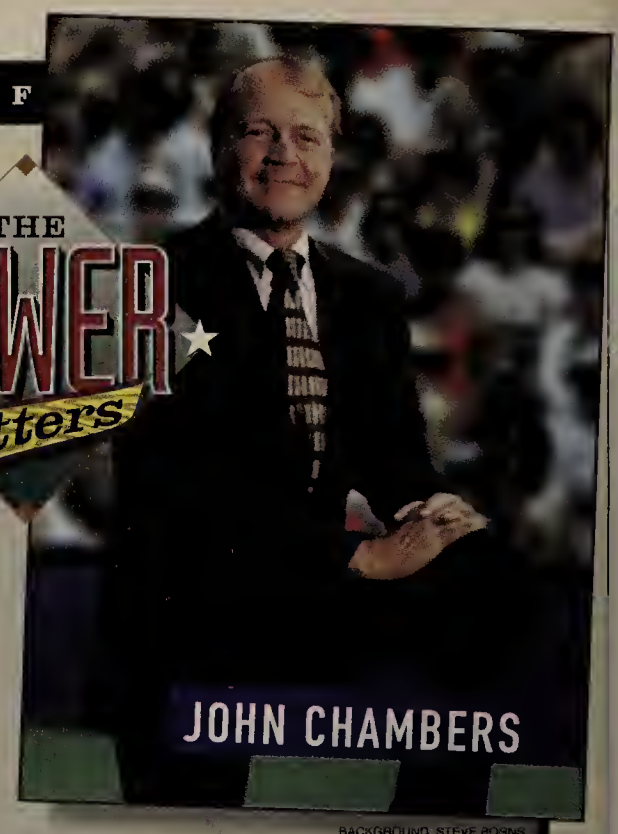
Cooper is on this year's list because he is, in essence, the ATM market at this point. Poke and prod as they may, the naysayers are proven wrong by Cooper. What's proven right is that, despite the growing list of alternatives, there is a business case for ATM in corporate networks.

JOHN DOERR

Partner, Kleiner Perkins Caufield & Byers

Network Science 101. John Doerr is a catalyst. He makes things happen in the network industry. Specifically, he speeds up the chemical process by which ideas are turned into businesses, jobs and products. He makes the industry grow.

Doerr is a leading light at one of the high-tech industry's leading venture capital firms, having led investments in such companies as Compaq, Lotus, Sun, Cypress Semiconductor and Netscape. Those investments, KPCB claims,



BACKGROUND: STEVE BORNS

Keeping the big truck in overdrive

Last year at this time, Cisco was a $2 billion company. It is now a $4 billion company.

Last year at this time, Cisco had no presence in carrier WANs. With the StrataCom acquisition, it is now a leading supplier of WAN switches, and provides the backbone of public frame relay services from AT&T, Sprint and others.

Last year at this time, Cisco was on its eighth acquisition since 1993. It has acquired six more companies since then.

And in case anyone's expecting the switching revolution to end with routers facing the gallows, consider this: Cisco sold $1.1 billion of high-end routers in 1995. And it expects 1996 sales of high-end routers to be 40% higher.

As we stare 1997 in the face, Cisco will continue to grow, acquire, redefine and set the pace for the rest of the internetworking industry. Chambers is unshakably confident about Cisco's influence, potential and prospects. This is displayed in his bold acquisitions, most notably last April's $4 billion deal for StrataCom, the largest buyout to date in the internetworking industry.

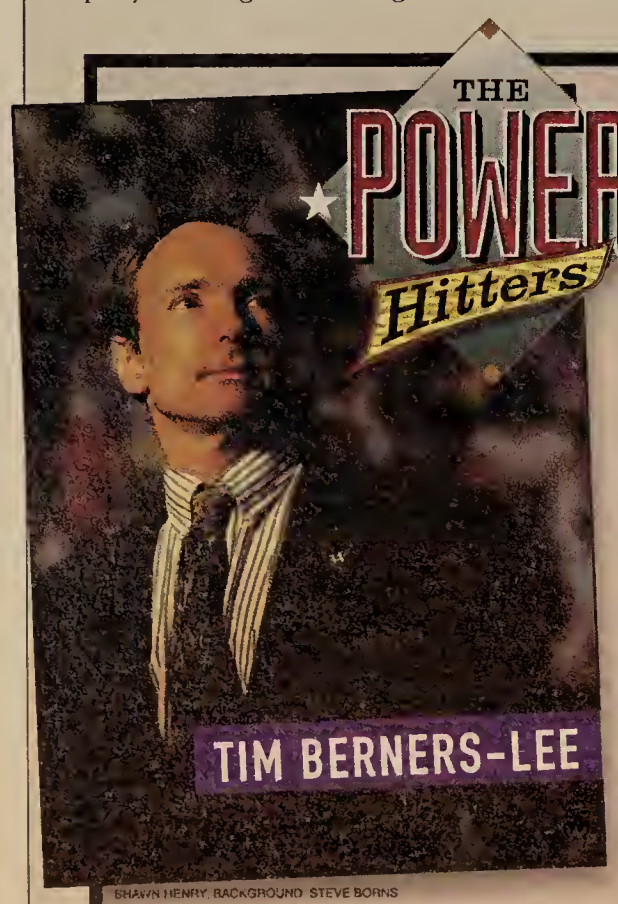
Analysts expect Cisco to be a $6.6 billion company at the end of fiscal year 1997. Cisco insiders say the company's goal is to reach $10 billion before the year 2000. There will be many bold moves along the way, and they will be orchestrated by John Chambers.

PLAYER STATS:

Name: John Chambers
Age: 47
Position: President, CEO
Team: Cisco Systems, Inc.

POWER FACTS:

Before joining this router powerhouse, the unassuming Chambers spent eight years at Wang Laboratories and six years with IBM — job stints that gave him a fear of losing market preeminence and a "healthy paranoia" that pervades Cisco's culture.



SHAWN HENRY; BACKGROUND: STEVE BORNS

Leading the guardians of the World-Wide Web

By now, you surely know that Tim Berners-Lee invented the World-Wide Web. The Web is so big and its influence so prevalent in our lives that it's hard to envision it as the product of one man's mind. But there it is — Berners-Lee is the Thomas Alva Edison of the flashy, colorful, increasingly animated and loud piece of the Internet most of us know.

Today, Berners-Lee is playing what may prove to be a more important part in the Internet's development. As director of the World-Wide Web Consortium (W3C), Berners-Lee is ensuring that the openness that makes the Web such a powerful, confusing and intriguing place isn't destroyed by vendors.

The W3C is an exclusive club of more than 125 companies that pay up to $50,000 a year in dues for the privilege of helping steer standards for such things as HTML, security systems, and content selection and filtering technologies. W3C members include Microsoft, Netscape, IBM, AT&T and virtually every other big name in the industry.

The risk is that as vendors seek to profit from the Web, they'll push the technology boundaries to gain an edge on competitors. That could put the openness of the Web — and its business value — at risk.

But never fear. Even the toughest players believe that Berners-Lee and his cohorts at the W3C will protect Web users from a proprietary future.

PLAYER STATS:

Name: Tim Berners-Lee
Age: 41
Position: Director
Team: World-Wide Web Consortium

POWER FACTS:

So where does the inventor of the Web go when he's on the Web himself? Berners-Lee lists two of his favorite sites as the oxygen-lit barbecue (don't ask) at www.ghg.ecn.purdue.edu and The Sunday Times at www.sunday-times.co.uk.

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led to the creation of more than 30,000 jobs.

Having helped found the PC and network industries, Doerr and KPCB are now nurturing the growth of the Internet industry — in particular, Java-related start-ups — via a $100 million Java venture fund backed by such partners as IBM, Oracle, Sun and Compaq.

Among the recent 'Net investments are Netiva Software, which will help customers build Java-based database applications; Marimba, with its Castanet and Bongo Java development tools (see Kim Polese profile, page 48); Amazon.com, an amazing online bookstore; and Precept Software, which is targeting support for streaming audio and video on the Internet.

Doerr serves on Precept's board of directors, as well as on the boards of Intuit, Netscape, Shiva and Sun, among others.

Doerr and KPCB hold the purse strings for an industry. So if you've got a vision of a better high-tech mousetrap, find this guy at a cocktail party and sidle up to him.

BERNARD EBBERS

CEO, president, WorldCom, Inc.

How's this for the quintessential success story?

A young man goes from delivering milk door-to-door in his hometown of Edmonton, Alberta, to playing basketball on a scholarship at Mississippi College in Clinton.

He earns a bachelor's degree in physical education, then takes jobs as a teacher, coach and warehouse supervisor at a garment factory. Striking out on his own, he buys a motel-restaurant in Columbia, Miss., and expands the operation into a chain of nine motels.

Our hero takes his hard-won earnings and becomes a "passive investor" in a telecommunications start-up.

The start-up struggles, so he takes over as CEO. He launches a bold acquisition plan, which culminates in a $14 billion buyout of a major competitive access provider, which itself had just acquired one of the leading Internet service providers.

He finds himself at the helm of a network giant that promises a set of local, long-distance, Internet and international services that better-heeled rivals such as AT&T and MCI are still working to package up.

Sound far-fetched? It's the life story of Bernie Ebbers, whose WorldCom finds itself in a starring role on the shifting stage of world telecommunications. Ebbers really shook things up this summer when he announced plans to buy MFS Communications, which had just acquired ISP UUNET Technologies.

With all the regulatory and political uncertainties in the telecom arena today and with plenty of other big guns in the game, Ebbers has his work cut out for him.

But if Ebbers' track record is any indication, look for WorldCom to keep shaking things up. Not bad for a former milkman.

WILLIAM GATES

Chairman, CEO, Microsoft Corp.

What is it that makes Bill Gates so successful?

Is it intelligence? Cunning? Ruthlessness? Whatever it is, critics and admirers alike have to agree that this guy is a moving target. Just when his enemies seem to have him dead to rights, he changes course and the hunters wind up the hunted.

Case in point: Netscape. Conventional wisdom was that Netscape and the Internet revolution would turn the tables on Microsoft, making its business model obsolete.

CINDY CHARLES

But in what is arguably the most nimble turnaround in corporate history, Microsoft and Gates have not only embraced the Internet, but have put Netscape squarely in their crosshairs.

Some pundits wonder aloud whether Netscape can survive the withering blasts of icy wind from Redmond, Wash.

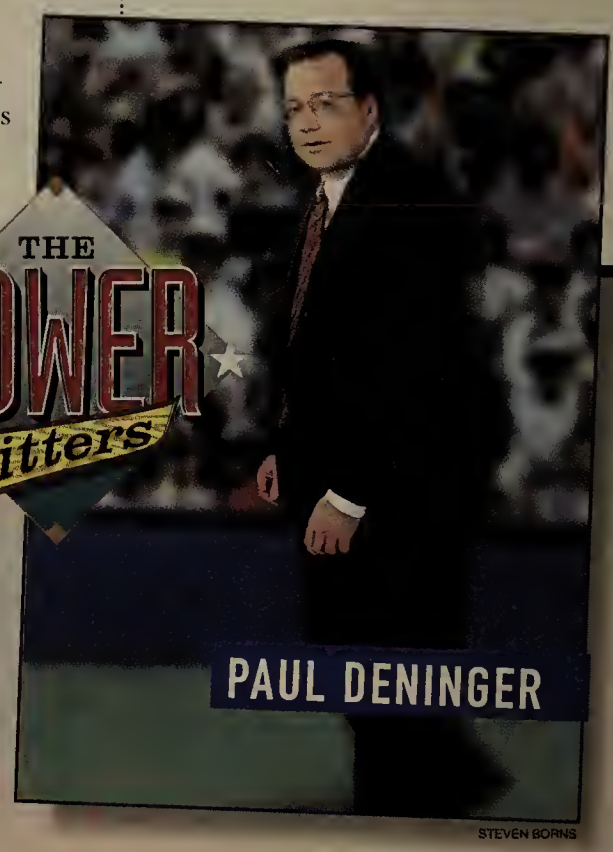
Need more proof? Consider Microsoft bashers Oracle and Sun and their network computer (NC) visions. The thin client spells the end for Microsoft's hegemony? Don't count on it. Gates and fellow paranoiac Andy Grove of Intel have come up with their own NC plan that may play better to corporate customers who view PCs as their new legacy systems.

Java will dominate the industry? Hello, ActiveX.

In the past year, Microsoft released an improved version of NT, as well as new Internet and intranet tools for development and electronic commerce, and it is rolling out new applications that are Internet-enabled. The company also started — finally — to flesh out its enterprise directory plans.

Microsoft is barreling straight ahead on the content front with an Internet-retooled Microsoft Network, tons of multimedia offerings and the MSNBC Internet-television effort.

Can Gates keep dodging bullets forever? Hard to say. But for now, he's the one who keeps nailing the targets.



STEVEN BORNS

The network industry's matchmaker drives M&A mania

If you're a network manager, you've probably never heard of Paul Deninger, even though he's changing the face of your network as you read this.

If you're the CEO of a network company that's trying to expand its product line, or you want to get out while the getting's good, Deninger is definitely the man to know.

Deninger is one of the key figures behind the merger and acquisition activity that is reshaping the internetworking industry. Since joining Broadview in 1987, Deninger has completed more than 100 mergers and acquisitions. Early on, he focused mostly on software, particularly client/server applications and development tools.

It wasn't until late 1994 that he set his sights on internetworking, launching the firm's networking practice. Deninger says he realized corporate networks weren't ready for client/server prime time and that vendors would have to expand their product portfolios through buyouts and mergers.

Under Deninger, Broadview has completed 24 M&A transactions in the last 18 months, more than any other M&A advisor. He's been involved with 3Com's buyout of Axon Networks, Cabletron's acquisition of ZeitNet and Netlink, and Bay Networks' deals for Xylogics and Penril Datacomm Networks.

In the past couple of years, the internetworking industry has become the most acquisition-prone segment of the information technology business.

Love it or hate it, you can thank Deninger for that.

PLAYER STATS:

Name: Paul Deninger
Age: 38
Position: CEO
Team: Broadview Associates LLC

POWER FACTS:

Deninger claims to have initiated the current wave of so-called high-value/zero revenue acquisitions in networking when he advised Israel-based NiceCom, Inc. during its 1995 buyout by 3Com Corp. NiceCom sold for nearly $60 million even though it had no product revenue at the time.

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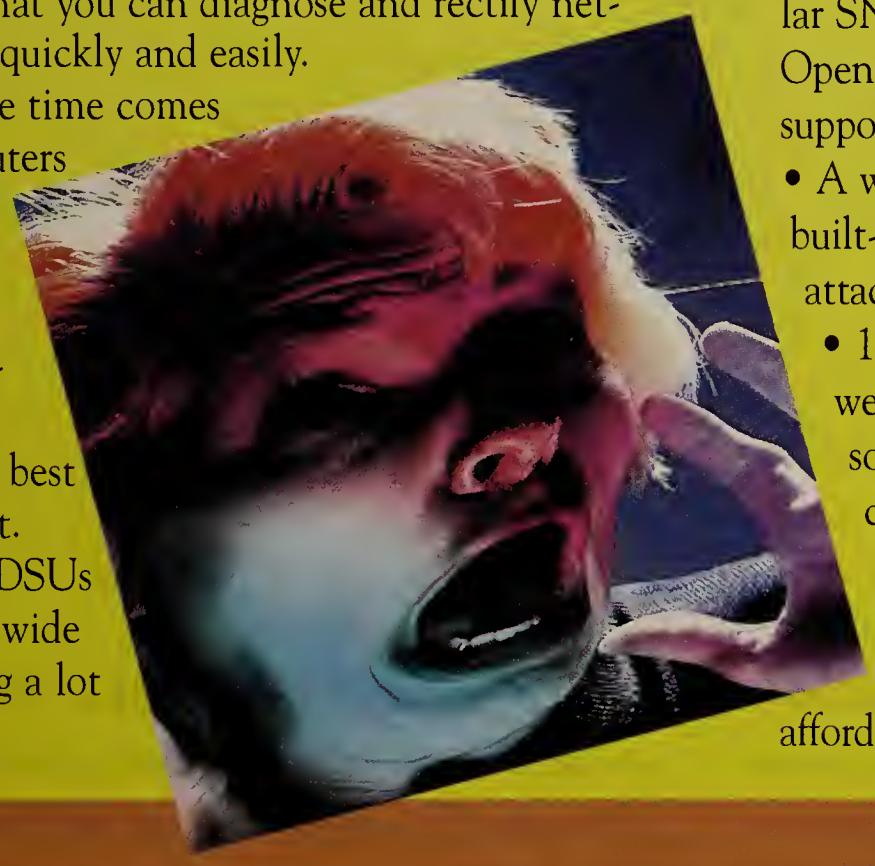
So when the time comes to link your routers over a wide area network, stick with a respected, dedicated company which has your best interest at heart. **Racal** ™ CSU/DSUs will help make wide area networking a lot less scary.



Racal CSU/DSUs offer proven performance, unrivaled capabilities:

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Extensive Enterprise MIB	✓				
TELNET client support	✓		✓		
Built-in Ethernet port	✓				
Easily accessible performance data	✓				
LCD front panel	✓	✓		✓	✓
DTE data ports available	1, 2 or 4	1, 2 or 4	1 or 2	1, 2 or 5	1, 2 or 4+
High density central site models	✓	✓	✓	✓	✓
Flash Memory	✓	✓	✓		
Lowest cost	✓				

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Access to Multimedia Information Networks

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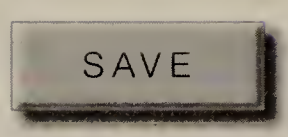
the information

on the planet.



Somehow, the smaller the world gets, the more its information grows. Each day, networked computers are making more kinds of information available to more people than ever before. From last night's sales figures to next year's economic forecasts, information is the life-blood of business. And that makes managing and storing it even more vital.

At IBM, we're constantly thinking of new ways to maximize the value of information to your company. Part of which means understanding that different kinds of users can have different kinds of storage needs. For some, the reliability of a 24-hour, seven-day-a-week system is critical. For others, having fast access is key. And with rare exception, cost is always an important consideration.

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RAMAC Scalable Array lets you add both capacity and performance when your requirements change. Need more speed? The RAMAC Electronic Array gives users hyperfast access to stored data. And if your priority is simply the highest level of data availability, the new RAMAC 3 delivers it with twice the capacity and up to three times the speed of our earlier designs.

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NetworkWorld Executivebriefing

VISIONS FROM TODAY'S LEADING NETWORKING COMPANIES.

continued . . .

Deborah
Triant
President and CEO
Check Point Software Technologies, Inc.

With the widespread adoption of Internet/intranet technology, networks are defined by enterprise-wide security policies. Companies require one policy that integrates all aspects of network security to provide secure connectivity for all of their worldwide offices, remote and mobile users, customers and business partners. As the market leader in network security, Check Point Software Technologies has pioneered this capability with its open, extensible management framework called OPSEC (Open Platform for Secure Enterprise Connectivity).

Sheldon B.
Revkin
Sr. Vice President, North American Sales and Marketing
Hughes Network Systems, Inc.

For 25 years, Hughes Network Systems has pioneered satellite, cellular and terrestrial communications systems for both private and public networks worldworldwide. Our position in this dynamically evolving industry remains strong through 1) rapid response to market developments; 2) a deep technological base supporting world-class products and customers; and 3) outstanding employees empowered to provide consistent customer care.

David C.
Ruberg
Chairman and President
Intermedia Communications, Inc.

Intermedia Communications will be a premier full service telecommunications provider delivering end-to-end services to business, government and IXC customers. Intermedia believes that offering innovative, forward thinking technologies through a solution-oriented sales and support approach benefits our customers and adds value to their networks. Intermedia is known for its ability to package customized "no assembly required" solutions to meet each customer's specific requirements.

Fernand
Sarrat
President and CEO
Cylink Corp.

Cylink is in two of the most promising areas of the IT industry. It is the worldwide leader of information security solutions, with products that enable secure data transmissions and electronic commerce over the Internet, intranet, local area networks (LANs), wide area networks (WANs), asynchronous transfer mode (ATM) and frame relay networks. Cylink is also a leading global supplier of fixed, outdoor wireless communications infrastructure.

Ed
Kennedy
Vice President, Marketing
Alcatel Data Networks

Alcatel Data Networks (ADN) provides next generation equipment allowing carriers and corporate enterprises to migrate from connectionless-oriented to connection-based networks to provide Quality of Service (QoS) across the WAN for a host of data protocols and delay sensitive applications. ADN's architecture is based on the Avanza™ network strategy which provides seamless desktop-to-carrier connection and management. With unparalleled global coverage and support, ADN is uniquely positioned to build networks spanning every corner of the globe.

James A.
Risher
President and CEO
Exide Electronics Group, Inc.

To be the worldwide leader in Strategic Power Management™: a way of doing business that mobilizes technologies, products, services and partnerships to ensure the availability of mission-critical applications. With Strategic Power Management, Exide Electronics delivers comprehensive power management solutions critical to our customers' strategic goals.

Eric
Benhamou
President and CEO
3Com Corp.

As the 21st century approaches, access to information will become much simpler and more affordable than it is today. Connectivity will span the globe, touch everyone in society, and operate in a fully deregulated environment. 3Com will build pervasive networks to unleash the power of access for anyone, anywhere, anytime.

C.J.
Funk
President
GN Nettest, Azure Operation

To provide leading-edge network analysis products, services and support of the highest quality and value that fully address the needs of our customers; to promote a work environment that inspires our employees to take the initiative and be rewarded for their achievements; and to become the prime supplier to our target market.

Peter
Mearsheimer
Vice President Sales
Network-1 Software & Technology

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THE NEWSWEEKLY OF ENTERPRISE NETWORK COMPUTING

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1 Industry: (check one only)

01. ☐ Manufacturers (other)
02. ☐ Finance/Banking
03. ☐ Insurance/Real Estate/Legal
04. ☐ Health Care Services
05. ☐ Hospitality/Entertainment/Recreation
06. ☐ Media/TV/Cable/Radio/Print
07. ☐ Retail/Wholesale Trade/Business Services
08. ☐ Transportation
09. ☐ Utilities
10. ☐ Education
11. ☐ Process Industries (Mining/Construction/ Petroleum Refining/Agriculture/Forestry)
12. ☐ Government (Federal/State/Local)
13. ☐ Military
14. ☐ Aerospace
15. ☐ Consultants (Independent)
16. ☐ Carriers/Interconnects
17. ☐ Manufacturers (Computer/Communications)
18. ☐ Resellers of Computer/Network Products (VARs, VADs)
19. ☐ Systems/Network Integrators
20. ☐ Distributors (Computer/Communications)
21. ☐ Other *(please specify)*_____

2 What is your job function? (check one only)

NETWORK IS MANAGEMENT:

1. ☐ Networking Management
2. ☐ LAN Management
3. ☐ Datacom/Telecom Management
4. ☐ IS, IT, MIS, Systems Management
5. ☐ Engineering Management
6. ☐ Corporate Management (CIO, CEO, Pres., VP, Dir., Mgr., Financial Management)
7. ☐ Consultant (Independent)
8. ☐ Other *(please specify)*_____

3 What is the estimated value of networking equipment and services that you help specify, recommend or approve? (check one only)

01. ☐ $100 million or more
02. ☐ $50 mil. - $99.9 mil.
03. ☐ $25 mil. - $49.9 mil.
04. ☐ $20 mil. - $24.9 mil.
05. ☐ $10 mil. - $19.9 mil.
06. ☐ $5 mil. - $9.9 mil.
07. ☐ $1 mil. - $4.9 mil.
08. ☐ $500,000 - $999,999
09. ☐ $250,000 - $499,999
10. ☐ $100,000 - $249,999
11. ☐ None of the above

4 What is the total number of sites for which you have purchase influence? (check one only)

1. ☐ 100+
2. ☐ 50 - 99
3. ☐ 20 - 49
4. ☐ 10 - 19
5. ☐ 2 - 9
6. ☐ 1
7. ☐ None

5 Are you involved in the purchase of and/or plan to purchase network products and services?

☐ Yes ☐ No

6 Check ALL that apply in Columns A and B:

A. I am involved in the purchase of the following products/services:
B. I plan to purchase the following products/services:

LOCAL-AREA NETWORKS

A	B	
☐	☐	01. Local-Area Networks
☐	☐	02. Network Op. Sys. Software
☐	☐	03. LAN Storage/Backup
☐	☐	04. Optical LAN Storage/Backup
☐	☐	05. Disk LAN Storage/Backup
☐	☐	06. Tape LAN Storage/Backup
☐	☐	07. RAID LAN Storage/Backup
☐	☐	08. Network Test/Diagnostic Tools
☐	☐	09. Cables, Connectors, Baluns
☐	☐	10. UPS
☐	☐	11. Network Interface Cards
☐	☐	12. Peer-to-Peer LANs
☐	☐	13. SNMP Network Management
☐	☐	14. ATM Switches
☐	☐	15. Token-Ring Switches
☐	☐	16. Ethernet Switches
☐	☐	17. Remote LAN Access/Communications Servers
☐	☐	18. Superservers
☐	☐	19. File/Application Servers
☐	☐	20. Print Servers/Fax Servers
☐	☐	21. CD-ROM Servers
☐	☐	22. LAN Servers

INTERNETWORKING

A	B	
☐	☐	23. Bridges
☐	☐	24. Routers
☐	☐	25. Bridge/Router
☐	☐	26. Gateways
☐	☐	27. Intelligent Hubs
☐	☐	28. Stackable Hubs

COMPUTERS/PERIPHERALS

A	B	
☐	☐	29. Laptops/Notebooks/Sub-Notebooks
☐	☐	30. Micros/PCs
☐	☐	31. Minis
☐	☐	32. Mainframes
☐	☐	33. Workstations
☐	☐	34. Terminals
☐	☐	35. Printers/Network Printers
☐	☐	36. Cluster Controllers
☐	☐	37. CD-ROM
☐	☐	38. Fax/Modem Boards

REMOTE/WIRELESS COMPUTING

A	B	
☐	☐	39. PDAs
☐	☐	40. PCMCIA Devices
☐	☐	41. Wireless Data Services
☐	☐	42. Wireless Data Equipment
☐	☐	43. Wireless LANs
☐	☐	44. Cellular Equipment & Services

INTERNET/INTRANET

A	B	
☐	☐	45. Internet Access Service
☐	☐	46. Firewalls/Security
☐	☐	47. Web Servers

INTERNET/INTRANET (cont'd)

A	B	
☐	☐	48. Web Browsers
☐	☐	49. Intranet Applications/Groupware
☐	☐	50. Search Retrieval Products (web crawler)
☐	☐	51. Internet Development Tools
☐	☐	52. Internet Commerce Tools

SOFTWARE/APPLICATIONS

A	B	
☐	☐	53. Network Management
☐	☐	54. Systems Management
☐	☐	55. Security
☐	☐	56. Communications Software
☐	☐	57. Terminal Emulation
☐	☐	58. Word Processing
☐	☐	59. Operating Systems
☐	☐	60. Client/Server Applications Development
☐	☐	61. Database Management/RDBMS
☐	☐	62. Spreadsheet
☐	☐	63. Groupware
☐	☐	64. EDI
☐	☐	65. E-mail
☐	☐	66. Windows/Graphical User Interface
☐	☐	67. Multimedia
☐	☐	68. Graphics/DTP
☐	☐	69. Remote Access
☐	☐	70. Imaging
☐	☐	71. Server Suites (Back office, etc.)
☐	☐	72. Suites
☐	☐	73. Middleware
☐	☐	74. Document Management
☐	☐	75. Database Server
☐	☐	76. Site Metering Tools
☐	☐	77. Computer-Integrated Telephony (CIT)

WIDE-AREA NETWORK EQUIPMENT & SERVICES

A	B	
☐	☐	78. Frame Relay Equip./Services
☐	☐	79. Modems
☐	☐	80. FT-1/T-1/T-3 Multiplexers
☐	☐	81. FT-1/T-1/T-3 Services
☐	☐	82. SONET
☐	☐	83. Inverse Multiplexers
☐	☐	84. SMDS
☐	☐	85. Asynchronous Transfer Mode
☐	☐	86. Diagnostic/Test Equipment
☐	☐	87. DSU/CSU
☐	☐	88. VSAT/Satellite
☐	☐	89. ISDN Equipment & Services
☐	☐	90. PBXs
☐	☐	91. Voice Mail/Response
☐	☐	92. Videoconferencing
☐	☐	93. Leased Lines
☐	☐	94. Switched Data
☐	☐	95. E-mail
☐	☐	96. 800/900/MTS Services
☐	☐	97. Virtual Networks
☐	☐	98. Outsourcing/Systems Integration Services
☐	☐	99. Education/Training Services

❑ 107 ❑ None of the above (1-99)

7 Check ALL that apply in Columns A and B:

A. The following network platforms are currently installed:
B. The following network platforms are planned for purchase:

NETWORK PROTOCOLS

A	B	
☐	☐	01. SNA
☐	☐	02. DECnet
☐	☐	03. TCP/IP
☐	☐	04. Novell IPX/SPX
☐	☐	05. APPC/APPN/LU 6.2
☐	☐	06. NETBIOS
☐	☐	07. AppleTalk
☐	☐	08. NFS
☐	☐	09. IPv6
☐	☐	10. SNMP/SNMPv2
☐	☐	11. Other *(please specify)*_____

NETWORK OPERATING SYSTEM

A	B	
☐	☐	12. Microsoft (LAN Manager)
☐	☐	13. Novell (NetWare 2.X, 3.X)
☐	☐	14. Novell (NetWare 4.X)
☐	☐	15. Windows NT
☐	☐	16. Windows NT/Advanced Server
☐	☐	17. LocalTalk (AppleTalk)
☐	☐	18. Banyan (VINES)
☐	☐	19. IBM (LAN Server)
☐	☐	20. IBM (PC LAN Program)
☐	☐	21. Artisoft (LANtastic)
☐	☐	22. Digital (Pathworks)
☐	☐	23. Other *(please specify)*_____

LAN ENVIRONMENT

A	B	
☐	☐	24. 4M Token Ring
☐	☐	25. 16M Token Ring
☐	☐	26. Ethernet
☐	☐	27. Fast Ethernet
☐	☐	28. 100vg Any LAN
☐	☐	29. FDDI
☐	☐	30. LocalTalk
☐	☐	31. 10Base-T
☐	☐	32. ATM
☐	☐	33. Other *(please specify)*_____

COMPUTER OPERATING SYSTEM

A	B	
☐	☐	34. DOS
☐	☐	35. Unix/Xenix/AIX
☐	☐	36. OS/2
☐	☐	37. OS/2 Warp
☐	☐	38. IBM MVS
☐	☐	39. IBM VM
☐	☐	40. Digital VMS
☐	☐	41. Macintosh
☐	☐	42. Windows
☐	☐	43. Windows 95
☐	☐	44. NT
☐	☐	45. Solaris
☐	☐	46. Other *(please specify)*_____
☐	☐	47. None of the above (1-46)

8 What is your scope and involvement in purchasing decisions for network products & services for your enterprise?

A. SCOPE (check one only)
1. ☐ Corporate/Enterprise
2. ☐ Department
3. ☐ None

B. INVOLVEMENT (check all that apply)
1. ☐ Recommend/Specify
2. ☐ Approve
3. ☐ Evaluate
4. ☐ Determine the need
5. ☐ None

9 What is the total number of LANs, workstations/nodes at this location/ in your organization?

	At this location: LANs	Workstations/ Nodes	**Entire organization:** LANs	Workstations/ Nodes
1.	☐ 5,000+	☐	☐ 5,000+	☐
2.	☐ 1,000 - 4,999	☐	☐ 1,000 - 4,999	☐
3.	☐ 100 - 999	☐	☐ 100 - 999	☐
4.	☐ 50 - 99	☐	☐ 50 - 99	☐
5.	☐ 10 - 49	☐	☐ 10 - 49	☐
6.	☐ 1 - 9	☐	☐ 1 - 9	☐

10 Please indicate your involvement in developing/implementing Internet/ Intranet Technologies: (check all that apply)

1. ☐ Recommend/Specify
2. ☐ Approve
3. ☐ Evaluate
4. ☐ Determine the need
5. ☐ Implement
6. ☐ None

11 Which of the following hardware platforms are installed/planned in your company? (check all that apply)

	Mainframes A – Installed	Mainframes B – Planned	Minis C – Installed	Minis D – Planned
1.	IBM ☐	☐	IBM ☐	☐
2.	Amdahl ☐	☐	Digital ☐	☐
3.	Cray ☐	☐	Tandem ☐	☐
4.	Hitachi ☐	☐	Unisys ☐	☐
5.	Unisys ☐	☐	AT&T GIS ☐	☐
6.			HP ☐	☐
7.			Data General ☐	☐

What is the total number of Servers/Clients installed/planned: (USE NUMBERS ONLY)

E-AT THIS LOCATION #	F-% with Internet Access
t. Servers	%
2. Clients	%

G-ENTIRE ORGANIZATION #	H-% with Internet Access
t. Servers	%
2. Clients	%

Which of the following Servers/Clients do you have installed/planned: (CHECK ALL THAT APPLY)

	At this location: I-Servers	At this location: J-Clients	Entire organization: K-Servers	Entire organization: L-Clients
01. Power PC	☐	☐	☐	☐
02. Power Mac	☐	☐	☐	☐
03. Mac Other	☐	☐	☐	☐
04. Multi Processor Servers	☐	☐	☐	☐
05. P6	☐	☐	☐	☐
06. Pentium Pro	☐	☐	☐	☐
07. Pentium	☐	☐	☐	☐
08. 486	☐	☐	☐	☐
09. 386	☐	☐	☐	☐
10. 286	☐	☐	☐	☐
11. Risc	☐	☐	☐	☐
12. Other	☐	☐	☐	☐

12 Estimated gross annual revenue of your entire company/institution: (check one only)

1. ☐ $10 billion or more
2. ☐ $1 billion to $9.9 billion
3. ☐ $500 million to $999.9 million
4. ☐ $100 million to $499.9 million
5. ☐ $50 million to $99.9 million
6. ☐ $10 million to $49.9 million
7. ☐ $5 million to $9.9 million
8. ☐ $4.9 million or less
9. ☐ None of the above

13 Estimated number of employees at this location/in entire organization:

At this location:
1. ☐ Over 10,000
2. ☐ 5,000 - 9,999
3. ☐ 2,500 - 4,999
4. ☐ 1,000 - 2,499
5. ☐ 500 - 999
6. ☐ 499 or less

Entire organization:
1. ☐ Over 10,000
2. ☐ 5,000 - 9,999
3. ☐ 2,500 - 4,999
4. ☐ 1,000 - 2,499
5. ☐ 500 - 999
6. ☐ 499 or less

14 For which areas outside of North America do you have purchase influence? (check all that apply)

1. ☐ Europe
2. ☐ Asia
3. ☐ South America
4. ☐ Australia
5. ☐ Middle East
6. ☐ None

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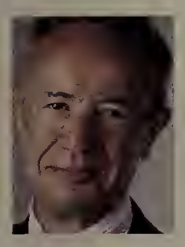
ANDREW GROVE

President, CEO, Intel Corp.

Andy Grove published a book this year titled *Only the Paranoid Survive: How to Exploit the Crisis Points That Challenge Every Company and Career* (Doubleday & Company, Inc., New York).

Grove *is* paranoid. He's fearful that people will run out of ways to use PCs. He's terrified that if people run out of ways to use PCs, they'll run out of need for Intel's microprocessors.

It's this paranoia that drives Grove to push the concept of network computing. With network computing, the potential applications for PCs — and Intel's processors — seem limitless.



Grove is doing more than just pushing the concept of connected PCs. In 1996, Intel unveiled the Pro Share VideoPhone system, which allows users of PCs with a 133-MHz Intel Pentium processor to engage in videoconferences over standard phone lines and existing modems.

Before VideoPhone, Pro Share relied on ISDN lines and PCs connected in LANs.

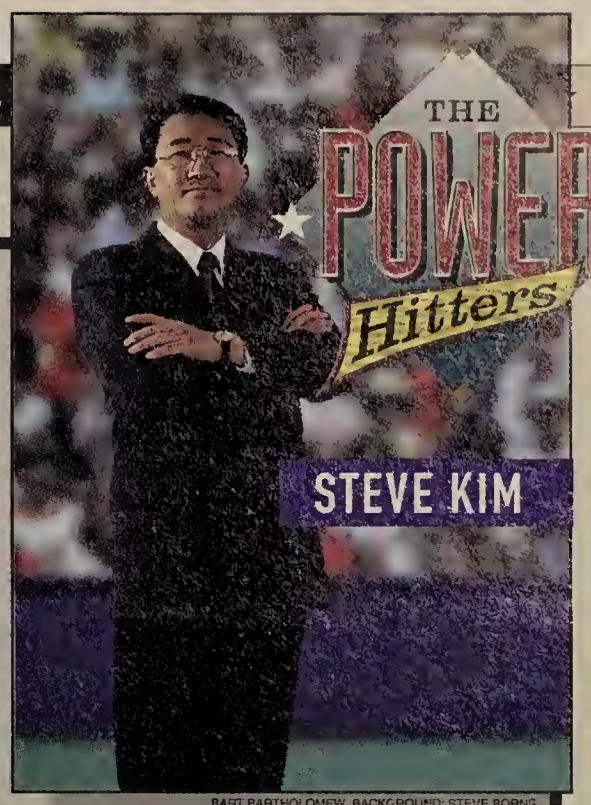
Grove has also been outspoken about the role networking plays in lowering the total cost of PC ownership. Intel this year announced software and hardware that let users configure new PCs across an enterprise network and simplifies the upgrading of existing PCs to 32-bit operating systems.

This is designed to greatly reduce the cost of managing desktop machines and give PC administrators control over which operating systems and applications run on those PCs.

In addition, by building management capabilities into PC motherboards and "integration-ready" management applications, vendors can help users trim 15% off the cost of owning and operating networked PCs, Grove said at an Intel-sponsored conference.

With developments like these, Grove continues to champion the cause of network computing. And he continues to challenge the networking industry to match the power of the PC and come up with new applications for network computing.

Seems like paranoia breeds vision. Seems like paranoia breeds innovation. Seems like paranoia breeds dominance in the PC industry. Seems like paranoia breeds power. Seems like paranoia is a good thing.



BART BARTHOLOMEW. BACKGROUND: STEVE BORNS

A virtual success story: Steve Kim and Xylan take VLANs to the heartland

Don't tell Steve Kim that VLANs aren't worth the trouble.

The Xylan founder has helped convince some big users, such as UCLA and the J. Paul Getty Trust, that despite growing skepticism, VLANs really do provide some benefits.

Kim's efforts have earned him the Los Angeles Economic Development Council's Fast 50 JumpStarter award. And last year, Xylan was the IEEE's Company of the Year.

For all the accolades and attention, Kim has also kept Xylan independent and flourishing in an industry where small companies that make a big impact are quickly snapped up by bigger fish.

Just check the numbers: For the 1996 third quarter ended Sept. 30, Xylan's revenue, net income and earnings per share all reached record levels. Revenue for the quarter increased to $35.4 million from $28.2 million in the second quarter — that's 300% more than third-quarter 1995.

Net income for the quarter was $4.6 million, or 10 cents per share, compared with second-quarter net income of $2.9 million or 6 cents per share.

Some critics say VLANs may not catch on. But Kim isn't buying that. In the face of mounting scrutiny, Kim is certain that Xylan and VLANs will continue to succeed.

PLAYER STATS:

Name: Steve Kim
Age: 47
Position: Chairman, CEO and president
Team: Xylan Corp.

POWER FACTS:

Kim, cofounder of VLAN-leader Xylan, is no stranger to start-ups. He also launched Fibermux Corp., where he served as CEO until June 1993. Ernst & Young tabbed Kim as Entrepreneur of the Year in July.

REED HUNDT

Chairman, Federal Communications Commission

With President Clinton's signing of the Telecommunications Act of 1996, Reed Hundt got two things in equal measure: expanded power over the telecommunications industry and a whole new set of headaches.

ALAN KLEHR. BACKGROUND: STEVE BORNS

Pushing ATM and WANs to the extreme

Tim Kuhfuss is a modern-day CAVEman.

Kuhfuss is spearheading projects at Argonne National Laboratory that test the limits of ATM. One of the projects, known as Cave Automatic Virtual Environments (CAVE), fuses ATM with virtual reality.

CAVEs are multidimensional virtual reality theaters used for displaying complex, interactive images to prototype new products and examine the behavior of complex molecules or viruses.

Kuhfuss's other project is Information Wide Area Year (IWAY), a prototype ATM WAN engineered and operated by a consortium of dozens of research institutions. IWAY is intended to explore ATM's potential for high-speed collaboration among geographically distributed research groups.

IWAY could interconnect CAVEs so automobile designers, for example, could simultaneously view a virtual life-size car model and interactively move or restyle body parts.

With CAVE and IWAY, Argonne has become a veritable petri dish for ATM. The lab dissects gear from all sorts of vendors, and determines the elasticity of high-bandwidth services from carriers.

Argonne's work is likely to have a profound impact on ATM standards, as well as service and product offerings. Leave it to a CAVEman to take us to the outer limits.

PLAYER STATS:

Name: Timothy Kuhfuss
Age: 35
Position: Director, Technology Division
Team: Argonne National Laboratory

POWER FACTS:

Tim is chair of the ATM Forum's ENR user technical requirements working group. He has been designing advanced telecommunications systems for more than 14 years, including creating Argonne Lab's ATM development program. He also developed campuswide Ethernet, FDDI and broadband systems for Argonne and the National Institutes of Health.

It was easy for the congressional talking heads to spout off about the information superhighway and the shining future of networking. But Hundt and his overtaxed staff at the FCC are the ones who actually have to turn all that legalese into rules that will ensure the growth of competition in this networked America of ours.

As if that job weren't big enough, the FCC doesn't have much time to write the rules. And every step the agency takes is subject to legal oversight.

Case in point: Local exchange carriers have already gotten a federal appeals court to block the FCC's so-called interconnection rules — a delay that clouds the picture for local-loop competition.

Headaches aside, Hundt now finds himself a central figure in the world's most vital networking market. He has a profound measure of control over how quickly key segments of the industry — including wireless, broadcasting, satellite, cable television and telephony — develop and converge.

Hundt has shown a willingness to go to the mat for consumers. He has pushed hard for reform of international calling rules that line the pockets of foreign telecom monopolies, and his sale of wireless spectrum — which was once just handed away — raised billions for the federal government. He has also proposed to scrap tariffs, a move that could make it easier for customers to negotiate better calling deals.

With all that Hundt has on his plate, vacation time will be at a premium. That is, at least until his term expires in mid-1998. After that, who knows?

DENNIS JONES

Senior vice president, CIO, Federal Express Corp.

Need a business case for using the Internet?

Check out InterNetShip at http://www.fedex.com. It allows you to prepare overnight packages for shipment without picking up the phone and calling Federal Express.

InterNetShip is Dennis Jones' baby. It shows just how powerful the Internet can be as a business tool. Certainly, if a company that ships nearly 2.5 million items to 211 countries every day has confidence in the Web, there might be something to that....

But InterNetShip is just one example of the innovation Jones has brought to FedEx during his five years as information chief — and just one of the reasons why he makes a return trip to the 25 Most Powerful list.

Jones has migrated one of the world's largest mainframe-based IT organizations into a client/server infrastructure; spearheaded development of PowerShip, an automated shipping system that handles nearly two-thirds of FedEx's express package volume; and made FedEx a leader in conducting business electronically on a global basis.

Indeed, the operation Jones oversees within FedEx is the size of some of our leading internetworking vendors. He has a platoon of 4,200 IS warriors and a budget of $1 billion.

So if you're still worried about using the Internet for mission-critical business applications, just call up www.fedex.com. and ask yourself, where do you want to ship today?

JEFF MARSHALL

Senior managing director, Communications Technology Group, Bear, Stearns & Company

If it's new, if it's hot, if it's sexy, Jeff Marshall has it. If it needs its tires kicked, Marshall will kick 'em.

If you've only just heard about a new ATM backbone switch from a major vendor, odds are Bear, Stearns has been putting it through its paces for months. The global investment banking firm has tested and installed so many new products from so many vendors it should have its own seal of approval: Tested by Bear, Stearns (see our User Excellence profile of Bear, Stearns on page 80).

Marshall can make or break a networking company's business plan by his ability to break that company's spanking new product. When he's not doing that, he's managing all of the voice, data, video, image and market data trading technologies for this renowned securities firm with over $86 billion in assets and more than $7.1 billion in capital.

The equipment in Bear, Stearns' network is not for the faint of heart. The firm has a proprietary fiber-optic network operating at OC-96 speeds. That's 5G bit/sec on each link!

The Bear, Stearns intranet operates in excess of 20G bit/sec, connects more than 20,000 nodes worldwide and is managed as a virtual, object-oriented service environment — whatever *that* means.

And the firm holds more than 200 communications technology implementation "firsts."

Speaking of firsts, Marshall was the cofounder of the ATM Forum and its first corporate member. He was also recognized by *Institutional Investor* as a technology leader, representing both the buy and sell sides of innovative technology trends.

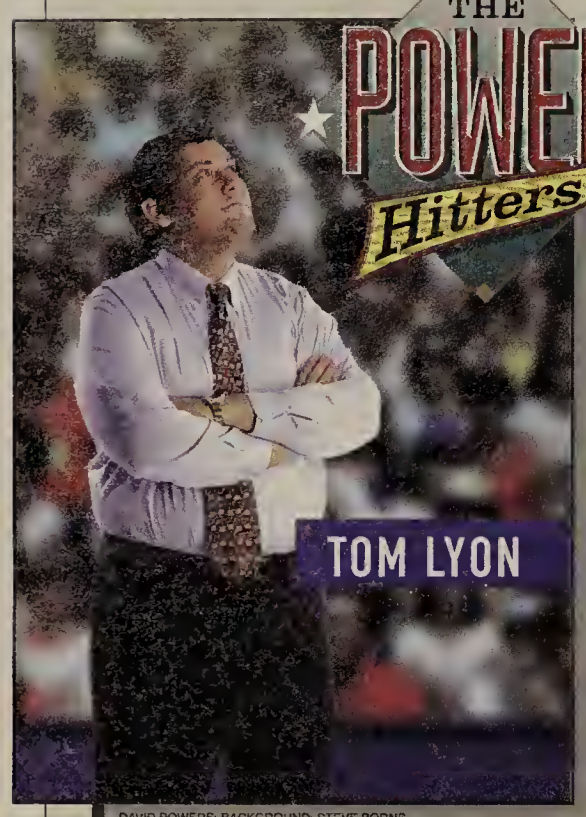
So, think you got a nice switch? Bring it on in. Bear, Stearns and Jeff Marshall will let you know just how nice it is... or isn't.

ROBERT MOSKOWITZ

Information systems technical support specialist, Chrysler Corp.

Bob Moskowitz is a driver in the network industry (pun very much intended).

Moskowitz has not only helped steer Chrysler (starting with its American Motors Corp. unit) from the mainframe



DAVID POWERS; BACKGROUND: STEVE BORNS

Playing David to Cisco's Goliath

Call him the Lyon that roared.

None of the established players could make Cisco sweat. Leave it to Lyon and his IP switching start-up to keep the router kingpin from becoming complacent with its remarkable success.

Lyon and Ipsilon last March introduced the world to IP switching, a method by which IP routing could be performed at ATM speeds. Ipsilon debuted at a time when the industry was debating whether to overhaul router internets with switched ATM infrastructures to relieve bottlenecks and support high-speed multimedia applications.

The trouble was that ATM standards were moving slower than a senatorial debate on C-SPAN. Meanwhile, Cisco was getting fatter and happier with each day the standards dragged along, each acquisition of a switch vendor and each new router that shipped to tighten its 70% market share grip.

Challenging Cisco's monopoly — and giving the company lots to think about — Lyon broke away from the ATM Forum and combined the best of ATM and IP. His efforts have earned Ipsilon's IP switch a Best of Show award at NetWorld+Interop and numerous supporters, including Digital, FORE, Ericsson, General DataComm, Hitachi and NEC.

His work also prompted a number of competitive responses and imitations, including Cisco's Tag Switching, IBM's Aggregate Route-Based IP Switching and Toshiba's Cell Switch Router. For that, and his ability to make the king of the IP jungle flinch, Lyon has indeed roared.

PLAYER STATS:

Name: Tom Lyon
Age: 41
Position: Founder, chief technical officer
Team: Ipsilon Networks, Inc.

POWER FACTS:

Lyon, who has shaken up the internetworking industry with his IP switching technology, was the eighth employee at Sun Microsystems, where he was not only principal architect of the SunLink product family, but also found time to author the ATM Adaptation Layer 5 standard in the ATM Forum.

NetworkWorld Executivebriefing

VISIONS FROM TODAY'S LEADING NETWORKING COMPANIES.

continued . . .

Alan
Taffel
VP of Marketing and Business Development
UUNET Technologies, Inc.

Corporate WANs will continue to migrate to the Internet, as advances allow companies to reap the 'Nets economies and reach without sacrificing security or quality of service. This migration will fuel the Internet's continued growth and will lead to entirely new architectures to handle the load.

Ward
Paxton
President and CEO
Optical Data Systems, Inc.

For over 13 years, ODS has been dedicated to the design, manufacture and implementation of high performance LAN solutions for Ethernet, ATM, FDDI and Token Ring. Through our next generation InfiniteSwitch™ series, ODS delivers dedicated connectivity to every device in the network while incorporating superior throughput, management, fault tolerance and security.

Stephen J.
Clark
President and CEO
OpenConnect Systems, Inc.

Browser based access to existing SNA applications from desktops, Webtops, thin clients and emerging non-traditional access devices will drive the re-centralization of back-end systems while revitalizing and distributing information to end-points never before imagined. Home banking, airline reservations, and loan applications may be completed from home using a Web-enabled TV and the "clicker" during commercials.

Jim
Mariner
President
ChatCom, Inc.

ChatCom, previously known as J&L Information Systems, is a leading supplier of award winning communications servers and application servers. Known worldwide, ChatCom's Chatterbox product line is synonymous with fault tolerant, adaptable, and highly managed networking servers. As ChatCom moves forward to the next century, it will be best known for its scalable network infrastructure products for Fortune 1000 companies.

Andrew
De Mari
President and CEO
ISOCOR

ISOCOR develops and markets electronic information exchange software. The multi-platform product line includes message and directory servers, desktop user agents, and gateways which enable reliable, secure electronic information exchange from the workgroup through the enterprise or inter-enterprise backbone network. ISOCOR's N-PLEX server software was awarded "Best Internet Product" by the Electronic Messaging Association. ISOCOR products are well known for their ease-of-use, reliability and leading-edge performance in commercial backbone environments.

Jerry
Parrick
President
!NTERPRISE America

!NTERPRISE is a leading national provider of advanced data networking integration services. We design, integrate and deploy state-of-the-art LAN/WAN communication networks with a family of high-speed data communications services, a portfolio of video/multimedia services and an Internet-based portfolio of network services. !NTERPRISE customers benefit from our expertise, experience, end-to-end customer service and best-of-breed partnerships.

Ronald A.
Howard
Chairman and CEO
Access Beyond

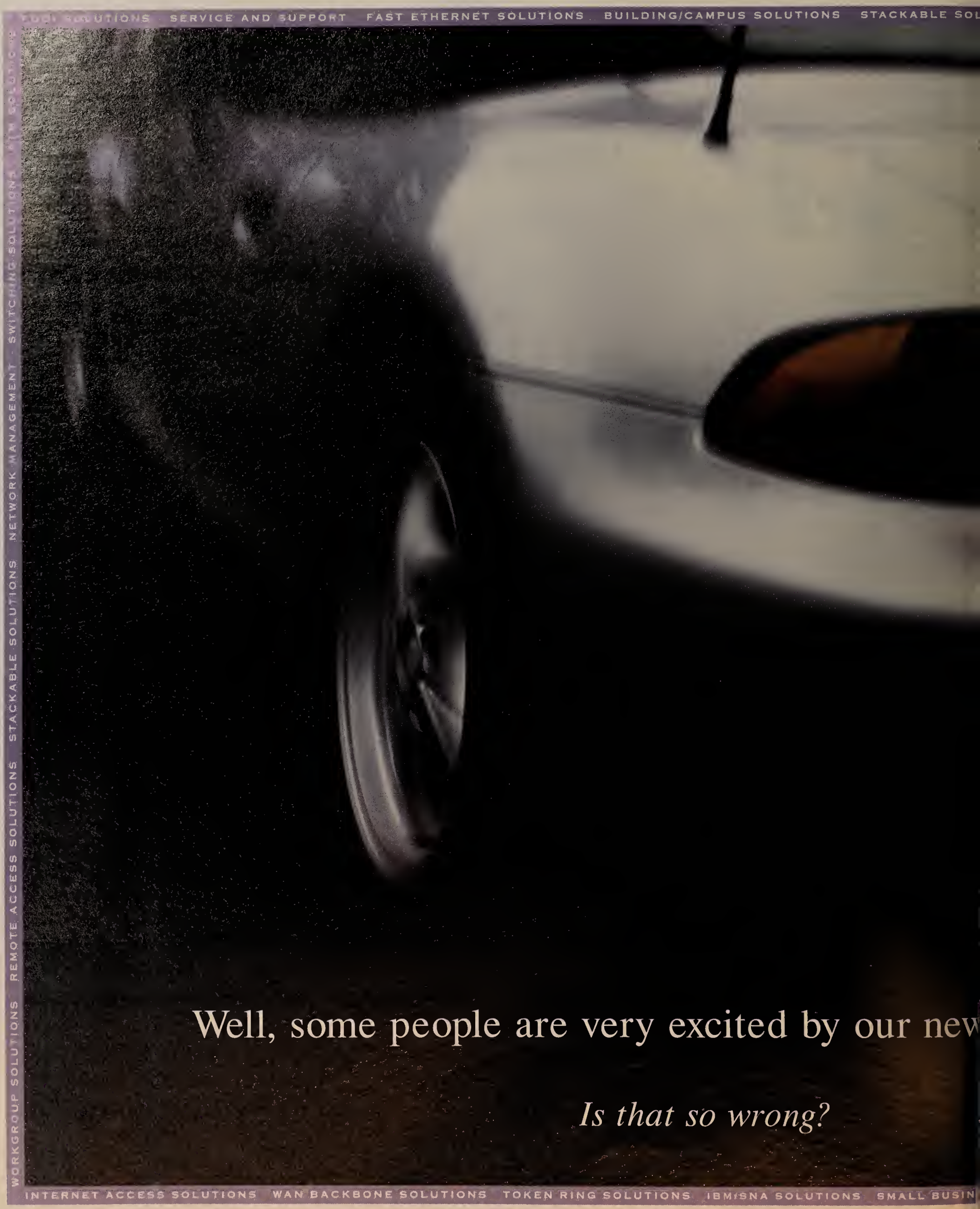
We are a company committed to delivering products and services that embrace advanced communication technologies; that go beyond conventional constraints. We strive for innovation in all of our products, our services and within each department of our company. We want our products to offer access that is beyond our competition and we want our company to be easy to do business with and accessible to our customers, vendors and all other business associates.

D'Arcy
Roche
VP and General Manager Premises Systems and Services Business
AMP, Inc.

AMP provides a unique single-source solution that includes network design, installation and management, and a comprehensive portfolio of copper and fiber cable, accessories, wireless LAN products and LAN interconnect systems. A key component of the AMP integrated solution is a new network infrastructure paradigm called Centralized Network Administration (CNA) which centralizes LAN electronics for simplified network management.

Dave
House
Chairman, President and CEO
Bay Networks

Bay Networks, Inc. is a leading worldwide supplier of high-speed switches, multiprotocol routers, intelligent hubs, and sophisticated network management products designed to meet its customers' unique architecture requirements. With its new market driven focus and structure, Bay Networks is positioned to target multiple market opportunities including service providers, small/home offices and global enterprise customers. In an industry of constant change, Bay Networks has remained a leader through providing the building blocks for intranet and Internet connectivity.



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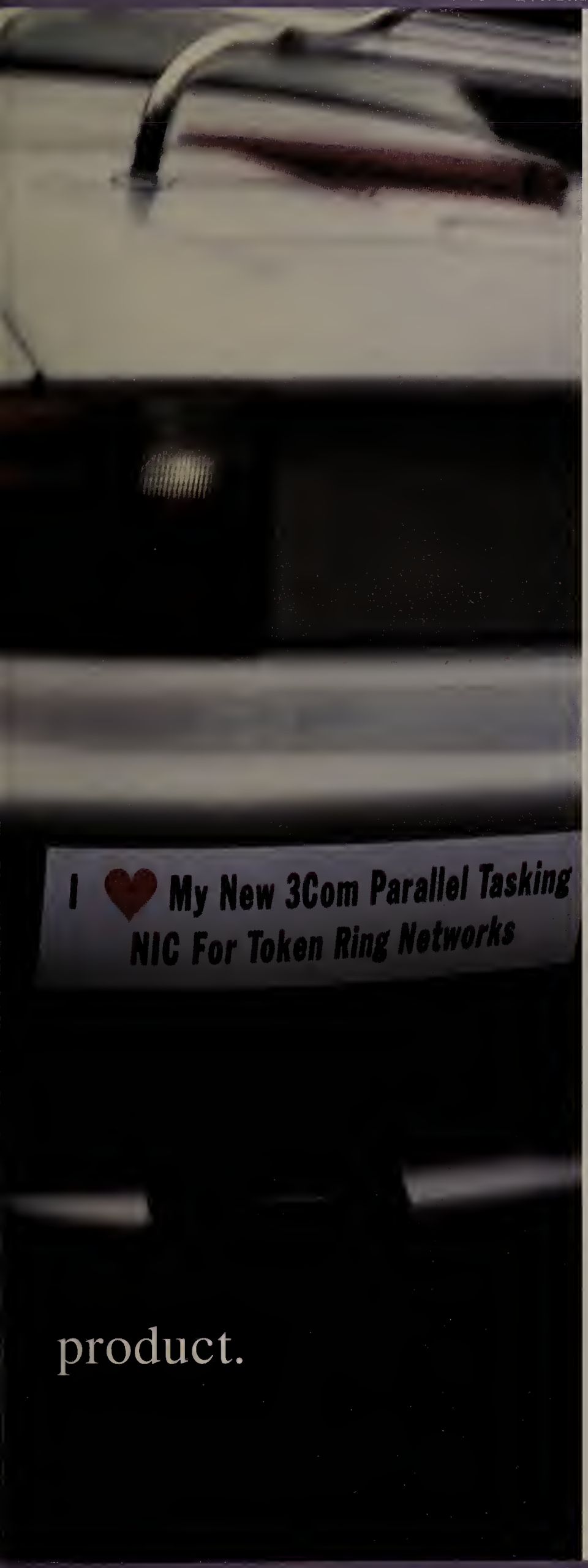

The 3Com TokenLink® Velocity™ ISA Network Interface Card was bound to get some people a little excited. That's because it really is a true innovation. For the first time ever, Token Ring networks can get the high performance that Parallel Tasking® technology provides. It's the same advantage 3Com's given to over 25 million Ethernet users.

Parallel Tasking technology gives you the fastest network throughput available as it pipelines data between the PC and the network. So you can transfer data faster than ever before.

The 3Com TokenLink Velocity ISA NIC offers more than just Parallel Tasking technology. It's backwards compatible with existing drivers, applications and network operating systems. And if you're considering switches, it has Full Duplex/DTR capability, which lets you send and receive data simultaneously.

To help you get your hands on one of these innovative new cards, we're offering evaluation pricing for just $99.*

Call **1-800-NET-3Com**, **Option 4** to get yours.

And learn why Parallel Tasking technology is something to get excited about.

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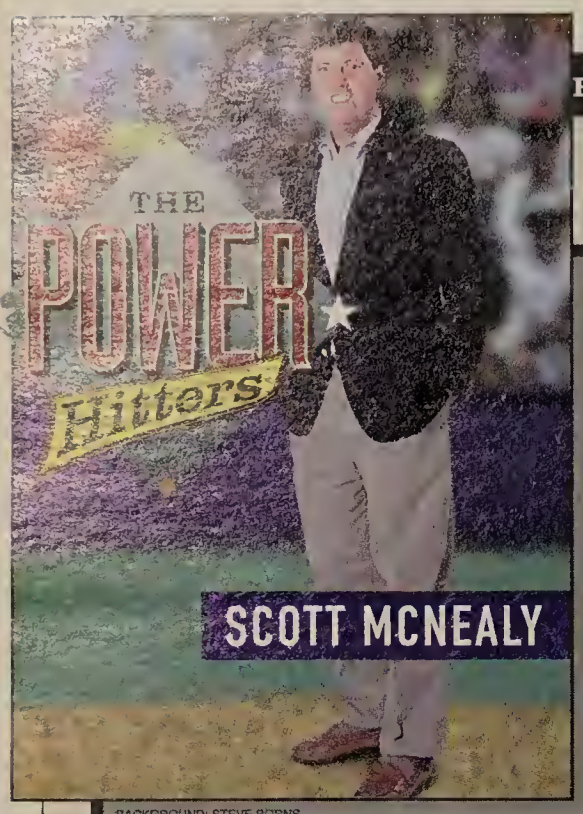
PERFORMANCE

3Com®



BACKGROUND: STEVE BORNS

Kicking butt and having some fun

He's led Sun to the top of the heap in the workstation business, in distributed computing and now in the Internet. Scott McNealy's resume is replete with events and technologies that have been instrumental in shaping the networking industry. From fostering a companywide perspective that "The network is the computer," to developing successful and ubiquitous technologies such as Open Network Computing, Network File System and Java, it seems like McNealy's Sun has shined on every networking day.

With the Java programming language, McNealy and Sun are taking on Microsoft in the battle of Internet application standards. Java appears to be winning on the mind share front — at least, if the headlines are any indication.

Sun's corporate brashness emulates that of cofounder McNealy. The company has been consistently profitable since he took the reigns in 1984. In 1995, two publications recognized Sun as one of the 100 best managed companies and McNealy as one of the nation's top 25 managers. And Technology Business Research Group recently rated Sun the No. 1 technology company.

Yet, McNealy refuses to stand pat. His passion for business and success rivals that of his passion for hockey.

"Kick butt and have fun," he says. He's doing both.

PLAYER STATS:

Name: Scott McNealy
Age: 42
Position: Chairman, CEO and president
Team: Sun Microsystems, Inc.

POWER FACTS:

McNealy says he has the best "24-hour-a-day job in the industry." What does he do all day? In his own words, "chat on the telephone, read lots of E-mail and trade rags, ride airplanes and give talks." McNealy loves controversy, saying: "If everyone believes in your strategy, you have zero chance of profit."

era to the Internet epoch, he is one of the key personalities behind the automotive industry's effort to use the Internet as the vehicle for delivering electronic data interchange information to suppliers.

Along with his counterparts from Ford Motor Co. and General Motors Corp., Moskowitz is at work on the Automotive Network Exchange (ANX), a secure, reliable, managed-IP network that could eventually supplant the private EDI networks the car manufacturers use today.

Moskowitz was principal author of the ANX project report and chairs the ANX security workgroup of the Automotive Industry Action Group (AIAG). He was also principal architect of the AIAG's proposal for EDI over TCP/IP.

As if that weren't enough work, Moskowitz serves on the Internet Architecture Board (IAB), where he is active in Domain Name System and trademark issues, security topics, and IPv6 design and deployment.

In April, he was named to a three-year term with the Advisory Committee of the Federal Networking Council, which counsels federal research networks on policy issues.

In his life with the automaker, Moskowitz has moved from MVS support, to personal computing support, to LAN support, to TCP/IP and remote access support — always paving the way for more open, distributed computing.

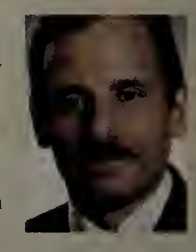
Like the network industry, Moskowitz keeps evolving, continually driving to new destinations.

JEFF PAPOWS

President, Lotus Development Corp.

If Jeff Papows has his way, no one will ever again ask the question: Did IBM blow it by shelling out $3.5 billion to buy Lotus?

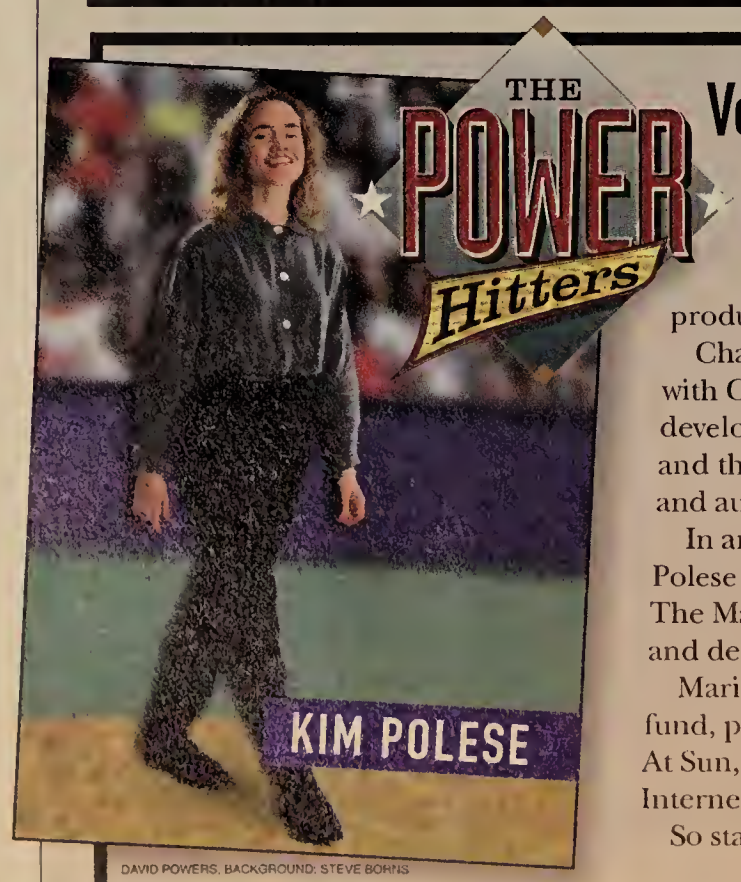
Just as IBM acquired Lotus and its share-of-mind-leading Notes product in mid-1995, the Web took off like a rocket, leading many to wonder just how valuable the groupware product would be in the future.



Since then, however, Lotus has done a remarkable job retooling Notes for the Web. In fact, if Papows and company can keep the momentum growing, Notes — or some variant of Notes — could wind up being one of the most important Internet/intranet applications.

Key to the Webification of Notes is Domino, which started out as a way to give users access to Notes data via the Internet but is building a life and brand of its own as a key Web development technology. In fact, more than 1,500 developers attended the premiere Domino Web Developer's Conference in Anaheim, Calif., in early November.

Lotus is also Internet-enabling



DAVID POWERS, BACKGROUND: STEVE BORNS

Voted most likely to succeed in the class of '96

What's on the intranet tonight?

Well, if Kim Polese has her way, the channels you'll be watching on your intranet will all be controlled by Castanet, Marimba's premiere product offering.

Channels? OK, this is going to take some getting used to. You see, Polese's idea with Castanet and Bongo, a Java development environment, is to make it easier for developers to build industrial-strength distributed applications that run on intranets and the Internet. The Marimba technologies enable client machines to connect to, and automatically get updates from, applications — or channels — across the net.

In an industry accustomed to overhyping everything from search engines to applets, Polese and her start-up colleagues — fellow Java insiders — have created a real buzz. The Marimba tools *could* change the way corporations and software companies build and deliver applications to end users.

Marimba got early funding from Kleiner Perkins Caufield & Byers' Java venture fund, probably owing as much to the innovative technology as to Polese's pedigree. At Sun, she helped formulate the Java strategy that pushed the company into the Internet limelight.

So stay tuned (forgive us): Marimba and Polese are worth keeping an eye on.

PLAYER STATS:

Name: Kim Polese
Age: 34
Position: Founder, CEO
Team: Marimba, Inc.

POWER FACTS:

Now you know the rest of the story. In 1993, Polese went to a Sun spin-off named FirstPerson to be project manager for Oak, an interactive television technology that ultimately became famous as a programming language for networked applications — that's right, Java.

Your WAN is one of them.

Any integrated access device can provide a WAN connection, but it takes Opera™ to keep it live, even while reconfiguring the system, implementing new network applications or adding/replacing system modules.

The new paradigm of software controlled telecommunications integration of data, voice, video and imaging over T1 begins right here, right now! With Opera, you get it all; ***prEVENT Mapping***™ *for alarm triggered network reconfiguration, programmable disaster recovery and back-up, automatic bandwidth allocation, and proactive configuration scheduling.*

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NetworkWorld Executivebriefing

VISIONS FROM TODAY'S LEADING NETWORKING COMPANIES.

Marshall
Roberts
President
Stonehouse Technologies, Inc.

A world leader in communications network management, Stonehouse Technologies provides solutions that go far beyond the installation of network technology. Stonehouse Technologies leads the way for resolving the current top priority issues of cost control, accountability and resource management for communications networks that are "mission critical" to today's enterprise delivery systems.

Robert J.
Rennick
VP and General Manager, Network Product Business
Digital Equipment Corp.

DIGITAL's network products and technology strategy support the company's mission by delivering leadership, enterprise-wide, high-performance network switching products. These products ensure that enterprises throughout the world can deploy the networks they need to meet their business goals today and into the future.

John
Rademaker
CEO
Sync Research

Wide area networks (WANs) are undergoing dramatic change, driven by an insatiable need for bandwidth and the birth of new and innovative access services carriers will use to deliver it. Sync Research provides advanced WAN access products and services which enable 1) the continuous evolution of mission-critical applications; 2) the roll-out of carrier managed services; and 3) the effective management of switched wide area backbones.

Noam
Lotan
President and CEO
NBase Communications

NBase is the leading manufacturer of enterprise LAN connectivity including Gigabit and Fast Ethernet. The natural environment of Gigabit LANs is computer intensive applications. NBase is integrating its Gigabit Ethernet switching into the GigaHub™. The resulting GigaFrame™ architecture provides a broad solution with connectivity to multiple protocols that are currently deployed in the enterprise including FDDI, ATM and Token Ring in addition to 10/100/1000 Ethernet.

Zora
Kirby
President and CEO
TeleProcessing Products

Technology integration, software controlled telecommunications, modular design and scalable architectures are converging concepts brought together by TeleProcessing's new integrated WAN access platform Opera, which is uniquely positioned to meet the new driving market demand for WAN access equipment and management tools. TeleProcessing's products are in keeping with its history and market reputation for innovative technology applications, user focused product designs, built-in migration paths, customer support, and product reliability.

Lowell
Hawkinson
Chairman and CEO
Gensym Corp.

Gensym is a leading supplier of software products and services for creating intelligent systems. As networks grow in size, complexity and function, it becomes increasingly difficult and expensive to have people manage them effectively 24 hours a day, every day. Using Gensym's Fault Expert software, network professionals are creating powerful solutions for intelligent network management, including root-cause fault diagnosis and analysis, and operator decision support. To manage their complex, dynamic networks, ESA, IRIDUM, and NASA Mission Control have turned to Gensym software.

Alan
Fraser
President and CEO
Digital Link Corp.

Digital Link Corporation (NASDAQ;DLNK) designs, manufactures, markets and supports a broad range of high-speed digital access products ranging from 56 Kbps to 155 Mbps for global wide area networks (WANs). The company's products are used by service providers as infrastructure equipment and by business enterprises for connectivity to WAN services such as leased lines, Frame Relay, SMDS and ATM. Digital Link is headquartered in Sunnyvale, CA with worldwide sales offices in the UK, Germany and Hong Kong.

Thomas
Goodwin
VP Sales, Marketing and Customer Service
ACC

The networking business continues to grow rapidly because as one market niche is filled another quickly emerges resulting in significant opportunity for innovation from networking vendors like ACC. For example, the rapid expansion of the Internet migrates users from a networking infrastructure dominated by voice to one which also incorporates data, video and image applications. ACC understands this migration and has the experience to build large multimedia internetworks to support this phenomenon.

Paul
Kozlowski
Chairman
Racal Data Group

Racal Data Group will be a global supplier of products and services and solutions providing access to multimedia information networks differentiated by security, modularity, management systems and committed to the innovation and time-to-market to achieve a top 3 position in the segments targeted. RDG will evolve into a globally focused information network access company growing at a 20% CAGR. RDG will be recognized for innovative products, services and solutions that will enable our customers to migrate to the emerging information network environment.

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That's life in the MIS department. And we know you like it. Parts of it, anyway. The other parts, the parts you don't like, can be left to us, whether it's planning, monitoring, maintenance or whatever. We can help.

We're !NTERPRISE Networking Services from U S WEST. 800-DATA-USW, http://www.uswest.com.

its applications such as SmartSuite and is pouncing on Java in a big way.

Perhaps more important, Lotus is getting tough. The company turned nasty toward former partner Netscape when that firm announced a more aggressive groupware and messaging strategy, with parent IBM saying it would no longer recommend Netscape products to customers.

Papows, who took over for Mike Zisman in October, has a tough job ahead making sure Lotus — and parent IBM — reap the rewards of the Notes investment.

But competitors are likely to find that Web-enabling Notes is an easier job than coming up with something as good as Notes to begin with.

MARC SCHILLER

Vice president, House of Blues

The entertainment industry is where networking's sexiest applications emerge.

Take the work that Marc Schiller's doing at the House of Blues, for example. Under Schiller's direction, House of Blues New Media constructed a pretty hot Web site with hotlinks and dialog boxes that virtually take you to the front row, onstage and backstage at HOB concerts.

One of those hotlinks is LiveConcerts.com, a partnership between HOB New Media and Progressive Networks, the developers of Real Audio. LiveConcerts.com is a Website for live and on-demand concerts that cybercasts such acts as Hootie and The Blowfish, The Cure, Stone Temple Pilots, Joan Osborne, The Fugees, Ziggy Marley and a host of others.

Why wait in line for tickets?

Schiller's most recent endeavor was the opening of House of Blues - Chicago, an "intelligent" entertainment and business venue that features a high-speed audiovisual interactive network.

This network enables clubgoers to access the Internet for Web-surfing, E-mail or videoconferencing from any room or booth in HOB - Chicago.

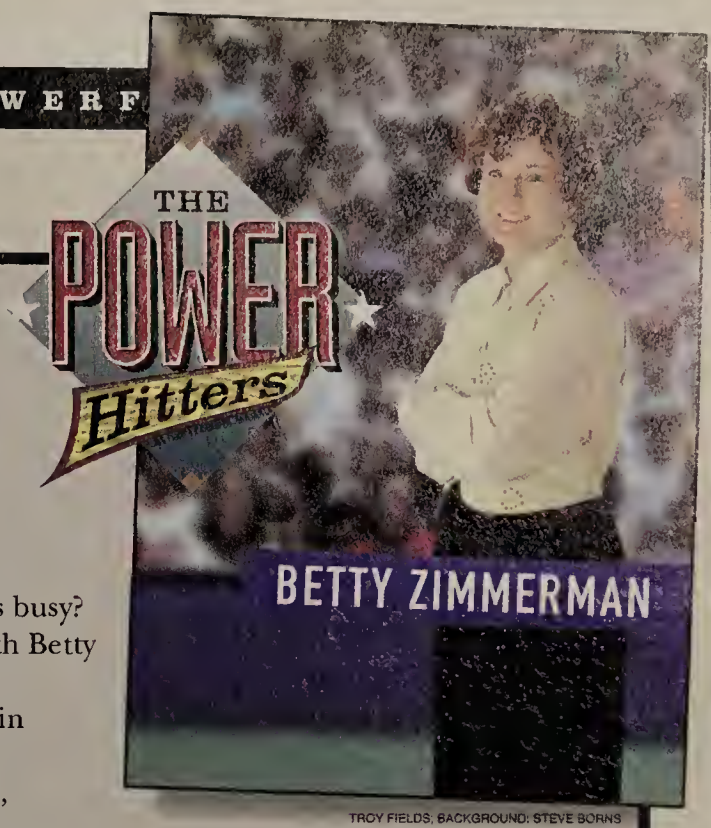
Schiller plans to equip other HOB locations around the world with this network.

HOB hired Schiller to spearhead its foray into interactive, multimedia entertainment.

Schiller is also charged with making sure HOB New Media hosts or cosponsors a series of conferences and special events aimed at nurturing creative dialog and a greater understanding of issues surrounding new technologies.

Looks like Schiller's work is paying off for HOB. It's also likely to set an example for multimedia and interactive projects at other entertainment — even business — conglomerates.

Who says network technology is boring?



TROY FIELDS; BACKGROUND: STEVE BORNS

Making sure the mail goes through

Think your life is busy? Spend a day with Betty Zimmerman.

A key figure within Texaco's Information Technology Department, Zimmerman is currently exploring initiatives in messaging, directories, document management, Internet electronic data interchange and intranets. Whew!

Since joining Texaco in 1991, Zimmerman has worked in database administration, advanced technology review, resource and project management, as well as business systems planning.

She's really made her mark in messaging. While overseeing Texaco's E-mail and groupware efforts, she made the business case and planned the consolidation of nine mail systems into one. The client/server messaging rollout is the single largest application deployment project ever undertaken at the company, and it will touch each of the company's 27,000 employees and every desktop by the time it is completed in mid-1997.

Zimmerman also took Texaco into the EDI world in the '80s, growing EDI from three trading partners and 500 transactions per month to more than 400 partners and 30,000 transactions monthly before moving on to a new challenge.

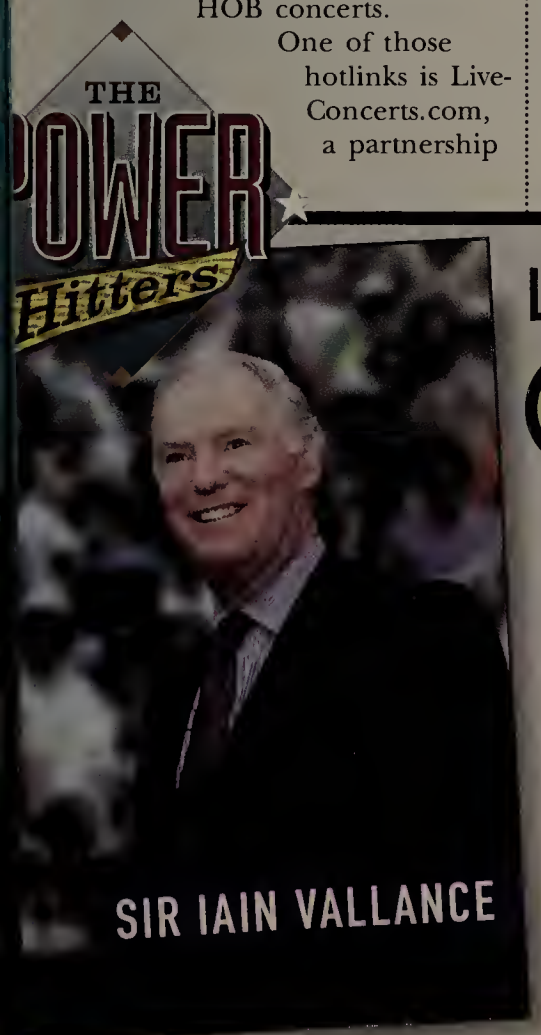
Today, Zimmerman serves on the board of the Electronic Messaging Association and chairs the American Petroleum Institute's Electronic Messaging User Group. If you want to get in touch with this dynamo, you'd better try E-mail. She's not at her desk.

PLAYER STATS:

Name: Betty Zimmerman
Age: 47
Position: Technology Leader
Team: Texaco, Inc.

POWER FACTS:

To make certain she wouldn't be shut out of any career options, Zimmerman not only got her Bachelor of Science degree in mathematics and computer science from the University of Mississippi, she minored in education and got a teaching certificate.



BACKGROUND: STEVE BORNS

Leading the British expeditionary force in telecom

Is this payback for the Boston Tea Party?

In November, Vallance shook up his rivals across the pond when he launched a $21 billion buyout of MCI, consummating an earlier financial deal that had given BT 20% of the aggressive American carrier. If the BT/MCI deal goes through — and it faces tough scrutiny from regulators — the combined carrier, dubbed Concert, will be nearly as large as AT&T and will have an international reach of impressive scale.

That Vallance and his once-stodgy BT could make such a splash is testament to the U.K.'s vision of building a competitive telecommunications market. And Vallance has navigated BT through many changes on the road to competition. He joined BT's board in 1981, took over as chief of operations in 1985, and a year later, he became chief executive officer.

If Vallance's MCI vision becomes reality, BT's worldwide operations will be shored up by MCI's 20%-plus share of the U.S. long-distance market. The two will have plenty of money to crack open the local calling market in the U.S. and expand Internet offerings here and abroad.

Perhaps their greatest advantage, however, will lie in their strengthened ability to build end-to-end global networks for international companies. MCI and BT already have a leg up on AT&T and Sprint, who manage loose alliances of international carriers, by dint of their existing financial arrangement.

With MCI in hand, Vallance can expand his British invasion around the world.

PLAYER STATS:

Name: Sir Iain Vallance
Age: 53
Position: Chairman
Team: BT

POWER FACTS:

When he's not engineering multi-billion dollar acquisitions like BT's planned buyout of MCI, what does this Briton do for relaxation? Why, hill walking and [illegible] of course

POWER-O-METER

A Reader Scorecard. We added a new twist to this year's Power Players issue when we asked network managers to rate the most powerful companies and business executives in the network industry. The Power-O-Meter shows who pulls the strings and whether their power is rising or slipping away.

MOST POWERFUL COMPANIES

1. Microsoft	83.04
2. Cisco	78.11
3. Netscape	76.49
4. 3Com	70.77
5. Sun	70.17
6. HP	69.60
7. Novell	69.26
8. Compaq	66.90
9. AT&T	66.15
10. MCI	65.91
11. Bay Networks	65.18
12. Oracle	64.86
13. IBM/Lotus	64.34
14. Cabletron	63.10
15. Sprint	58.94
16. FORE Systems	58.58
17. Nortel	55.79
18. Shiva	55.75
19. Digital	55.59
20. WorldCom	55.29

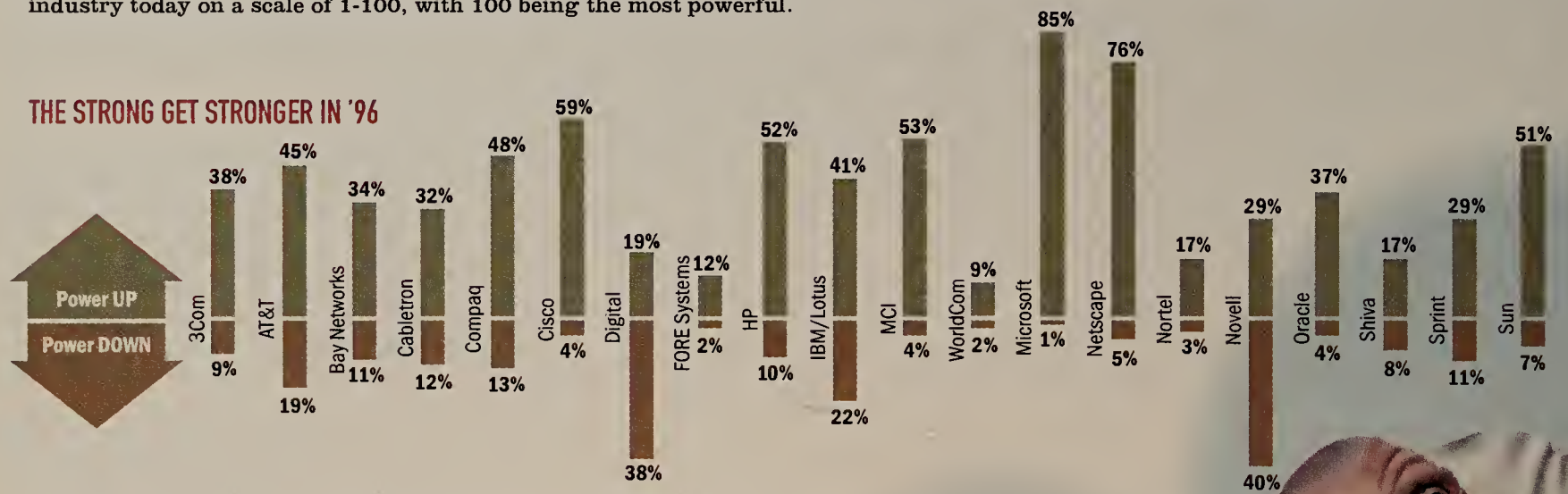
MOST POWERFUL CEOs

1. Bill Gates/Microsoft	81.41
2. James Barksdale/Netscape	74.49
3. John Chambers/Cisco	69.48
4. Scott McNealy/Sun	69.15
5. Lewis Platt/HP	66.05
6. Larry Ellison/Oracle	64.83
7. Eckhard Pfeiffer/Compaq	63.80
8. Bert Roberts/MCI	63.58
9. Louis Gerstner/IBM	62.53
10. Joseph Marengi/Novell	61.98
11. Robert Allen/AT&T	59.45
12. Eric Benhamou/3Com	59.32
13. Paul Severino/Bay Networks*	57.77
14. Robert Levine/Cabletron	56.98
15. William Esrey/Sprint	56.65
16. Frank Ingari/Shiva	52.74
17. Jean Monty/Nortel	51.71
18. Robert Palmer/Digital	49.63
19. Eric Cooper/FORE Systems	45.36
20. Bernard Ebbers/WorldCom	42.67

* Bay Networks CEO David House had not been named when this survey was conducted.

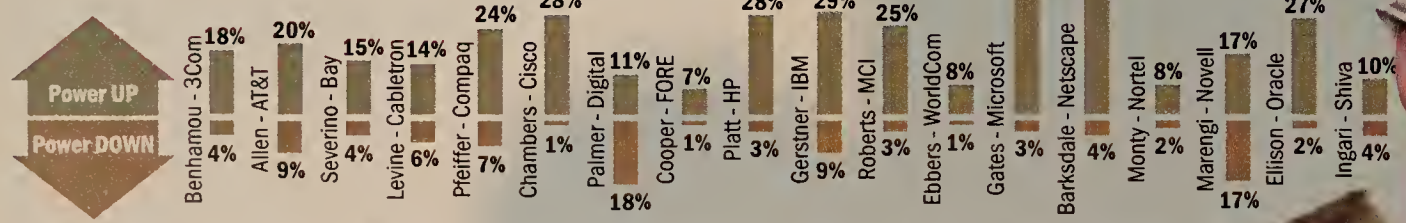
Microsoft takes the daily double at Power Park. We asked 300 readers to rate the influence these companies and executives exert over the network industry today on a scale of 1-100, with 100 being the most powerful.

THE STRONG GET STRONGER IN '96



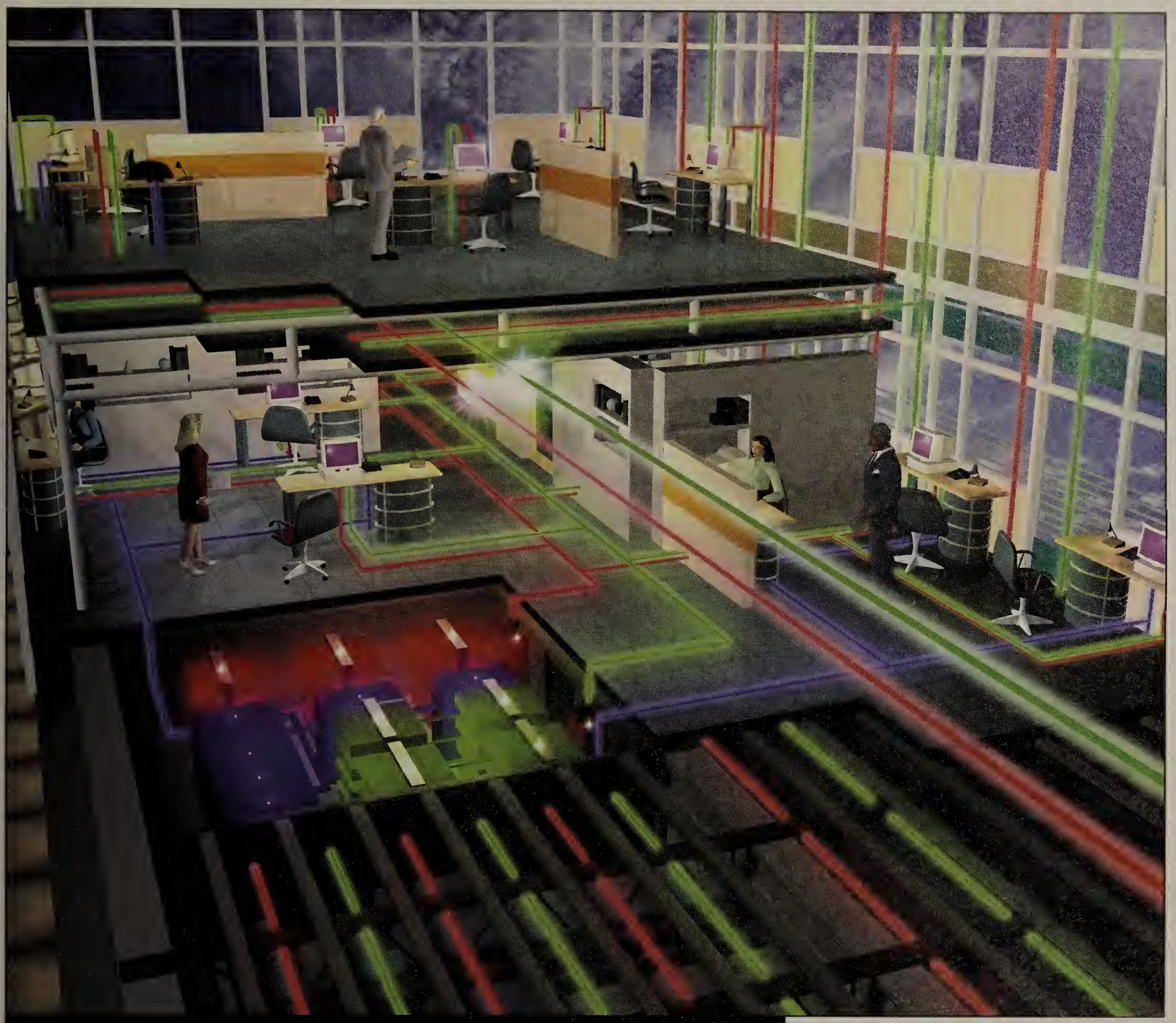
Netscape, Cisco, Microsoft, HP, MCI and Sun ran up some big numbers on the plus side, while Novell and Digital slid when we asked readers whether the companies gained or lost power in 1996.* For what's ahead in '97, see Network World Fusion (www.nwfusion.com)

FOR SOME, IT WAS A VERY GOOD YEAR



According to readers, browser battlers Bill Gates and James Barksdale got more muscular in 1996*, while Sun's McNealy, Cisco's Chambers, IBM's Gerstner, HP's Platt and Oracle's Ellison didn't do so bad for themselves. either.

* OK, you're asking: Shouldn't each company's total equal 100%? It does. The percentages *not* shown for each company represent readers who said the company's power had stayed the same or who wouldn't hazard a guess.



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and

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and

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and

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and

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library

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Mitch Oliver, QUALCOMM Incorporated

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my stuff

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status

So easy to learn and use, you may not need this!

help

Circle Reader Service #8

Forty more who make a difference in networking

Jim Allchin/Leading Microsoft's assault on the enterprise.
Howard Anderson/He calls it the way Yankee Group sees it.
Marc Andreessen/Netscape's technical icon.
David Beering/Amoco and Beering are pushing the ATM envelope.
Craig Benson/Pushing the aggressive Cabletron even further.
Scott Bradner/Clear voice in the Internet and internetworks.
Sandra Brown/Representing Sprint to big network customers.
Steve Case/AOL's bringing networking and the 'Net to the masses.
Vint Cerf/An asset to MCI and the Internet.
Colin Crook/Citicorp's king of technology.
Frank Dzubeck/Network vendors pay heed to his words.
Lt. Gen. Albert Edmonds/It's a wired military, and he controls it all.
Larry Ellison/Oracle's outspoken advocate for network computing.
Bill Esrey/Keeping Sprint sprinting in the telecom race.
Joe Firmage/Building the USWeb franchise around the country.
Elon Ganor/VocalTec is calling all callers on the 'Net.
Lou Gerstner/Turning around the good ship IBM.
Sally Grant/Driving the U.S. Auto Association into a new network future.
Frank Ingari/Shiva is still the one to watch in remote access.
Regina Keeney/Riding herd on the carriers for the FCC.
Dawn Lepore/Charles Schwab's most valuable net asset.
Joe Marengi/Getting Novell into fighting trim.
Rick McGee/IBM's quiet force in enterprise networks.
Gail McGovern/Running the business of AT&T's business services.
Bob Metcalfe/Voice of caution in the 'Net era.
Frank Moss/The Tivoli chief is revitalizing IBM's net management.
Tom Nolle/When this CIMI Corp. analyst speaks, vendors listen.
Eckhard Pfeiffer/Compaq still rules the roost in servers.
Jon Postel/Clearing up naming confusion on the 'Net.
Bert Roberts/MCI remains the fly in AT&T's ointment.
Patricia Russo/Chief of spin-off Lucent's business communications unit.
Peter Samuelson/Founder of Starbright World for seriously ill children.
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Where are they now?

By Joanne Cummings

Last year's power players continue to hold court.

While some have fallen from the public eye — most notably, former Novell chief Robert Frankenberg — the majority are continuing their reign, albeit with a shift in focus.

Frankenberg, who left Novell in August for pastures unknown, is staying far from the networking limelight he once commanded. Novell says his decision to leave was mutual and that Frankenberg is probably taking some well-deserved time off from the industry.

Will he return to his old Hewlett-Packard stomping grounds in '97? Stay tuned.

Alex Mandl was in a position of real network power last year as he managed AT&T's line-of-business breakup and transformation into a more nimble player in the telecom arena. Since then, however, he's ditched the top spot at AT&T to head up Associated Communications, LLC, an Alexandria, Va.-based start-up offering alternative wireless services.

Firms like his are positioned to pressure giants such as AT&T and MCI Communications Corp. as they reach into new businesses and fight for turf in the local access arena. In fact, Associated Communications won out in a recent government auction of wireless spectrum. Here's a past power player to watch in '97.

Paul Edmunds, senior network analyst at Duke Power Co., is continuing his crusade for scalability in the network management arena. But now this head of the OpenView Forum user group has set his sights on virtual LAN management, service-level agreements and total enterprise management.

"We're facing a lot of challenges in '97, including the need for total end-to-end management," he says. "That includes networks, of course, but it also means servers and applications. We see challenges in managing virtual networks and providing users with end-to-end service-level and quality-of-service agreements."

But Edmunds is optimistic. "I see the vendors starting to talk in real terms and starting to bring products together to make this possible," he says. "But still, there's a lot of work to be done. It's not trivial."

Lt. Gen. Albert Edmonds still commands the top post at the Defense Information Systems Administration (DISA). He is currently fighting for interoperable off-the-shelf applications for use in portions of the military network, especially the Defense Messaging system.

Edmonds has been a real force in pushing for integration between messaging heavyweights such as Microsoft's Exchange and IBM/Lotus' Notes. His leverage may eventually force these two technoarmies together for the benefit of users.

Dawn Lepore, chief information officer at Charles Schwab, has not rested on her laurels after successfully shepherding the discount brokerage firm to a client/server environment last year. She's now focused on getting vendors to understand the challenges in managing mission-critical client/server applications.

"The real benefit of client/server is quick time to market and economies of scale," she says. "But without strong client/server management tools, how far can we go? That's what I'd like to see more progress toward in '97."

Cummings is editor of "I/S Analyzer Case Studies," an information technology newsletter based in Needham, Mass.

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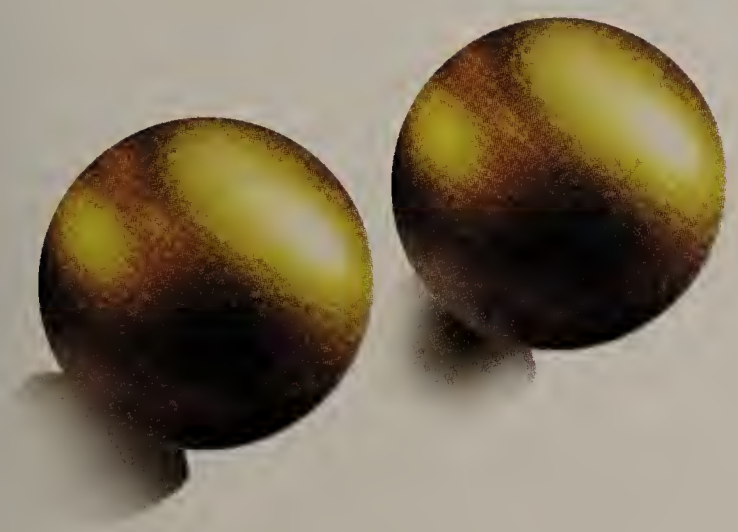

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POWER STRUGGLES

They won't be poking eyes and conkin' heads, but networking vendors will be going all out to make the competition look like stooges.

It will be company against company, technology against technology in 1997 as vendors vie for victory. To the winners go riches and a chance for networking immortality. For the losers, bankruptcy, obscurity and, more rarely, a second chance. In the following pages, we profile eight battles that will rage in the coming months and years — battles that you, the network buyer, will ultimately decide.

PHOTOGRAPHS: FPG INTERNATIONAL; SPOT ILUSTRATIONS: SAM WARD

Groupware vs. the Web

By Barb Cole

In 1996, pundits and even some large corporate customers began writing the obituary for traditional groupware — and particularly Lotus Development Corp.

Yes, groupware is dead, or at least on its last leg, critics claimed. After all, who needs proprietary groupware that requires custom applications and its own administrator when you can throw together an inexpensive intranet?

But by the tail end of the year, that view shifted. "All the proprietary guys now have a Web strategy," says Melony Hills, author of the recently published book *Intranet is Groupware.*

Lotus responded to the cry for standards-based groupware fast and last summer rolled out a Web server add-on for Notes, dubbed Domino. Rivals Microsoft Corp. and Novell, Inc. also sketched out plans to support Internet protocols in their messaging and groupware offerings.

The issue now isn't so much groupware vs. the Web, but rather one of how purely any of the products support 'Net standards. "Is it fully open or partially open is the question that companies are asking," Hills says.

While Lotus and other groupware makers have responded well to the Web threat, there is a camp that says only products built from the ground up to run on the Web are suitable. Fueling this argument are a handful of start-up companies. "It comes down to how open you are on the front end and back end," says Don Bulens, CEO of Radnet, Inc., which markets Internet-based groupware called WebShare. Bulens, a former Lotus executive, says although products such as Domino and even Netscape Communications Corp.'s SuiteSpot support 'Net protocols, they fall short by requiring proprietary software on the client. "These products work with browsers, but to leverage their servers' best stuff, you need add-on client software," he says

In contrast, WebShare was designed to work with plain vanilla browsers and multiple back-end servers, Bulens says.

Ken Bisconti, a Lotus Notes product manager, says that while companies want standard clients, the key is to provide a consistent set of groupware services — including full text indexing, replication, and security across clients and servers.

Bisconti admits the Web has fundamentally changed the market but the requirements of groupware have remained the same, and that's what products like Notes do best.

Switching vs. routing

By Jim Duffy

Last year at this time, the big controversy in the internetworking industry was whether or not switches would supplant routers as the anchor of corporate backbones.

Now the question may be why switching has not done that.

Indeed, in the great debate of switching vs. routing, there are two winners: switching and routing.

Like your spouse — you can't live with them, but you can't live without them — switching and routing reluctantly depend on each other. It is now apparent that rather than compete, switching and routing will converge to deliver the quality of service (QoS)-based multimedia network services we're all supposedly living for.

Switching has not killed off routing because users realize that a totally flat, switched network is bereft of the intelligence to steer traffic where it needs to go and could actually sap performance by propogating broadcast storms. Moreover, router vendors have boosted the switching capability of their devices to the point where they are essentially routing switches.

Cisco Systems, Inc. is feeling no pain, thank you, from the switches that were supposed to displace its high-end routers from corporate backbones. Sales of its high-end routers in 1995 were $1.1 billion, a 32% jump over the previous year. And Cisco expects 1996 sales to grow 40% above 1995 revenue.

About 65% of Cisco's high-end router sales still go into corporate backbones, with the remainder going to Internet service providers, says Frank Marshall, vice president and general manager of Cisco's Core Products business unit. And though Cisco sees the QoS-based network of tomorrow as a "Layer 3 problem," according to Marshall, the company is agnostic when it comes to whether that problem should be solved with packets or cells.

Cisco also is metamorphosing its routers into switches. The 7500 and next-generation Big Fast Router sport integrated route/switch processors and Versatile Interface Processors. The BFR also is expected to be based on a nonblocking crossbar switch matrix.

On the software side, Cisco's Tag Switching routes packets as if they were connection-oriented flows rather than connectionless datagrams.

Rival Bay Networks, Inc., which has its future invested in switching, has also tossed out the old routers vs. switches argument. The QoS-based network of tomorrow will be based on frames, packets and cells, says Ron Schmidt, Bay chief technology officer.

Meanwhile, routers can be used in client/server environments where 80% of the traffic is local, and Layer 3-capable switches can be used.

"The evolution of this, I wish I knew it exactly," Schmidt says. "I think of multimedia in the sense of Web-based stuff that sends more traffic in unpredictable flows. That pushes Layer 3 routing at the edge."

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Gigabit Ethernet vs. ATM

By Jodi Cohen

ATM backbone bigots beware: Gigabit Ethernet gear is on the way, and it just might give ATM a run for its money.

Both camps are taking aim at the LAN backbone in what likely will be one of the hottest contests in the coming year.

While ATM certainly enjoys a comfortable lead — with standards in place and products already shipping — some analysts claim that Gigabit Ethernet's lower cost and similarity to good ol' Ethernet could help it catch up and even pull ahead.

ATM is a good choice for building high-speed campus backbones that require quality-of-service capabilities for multimedia traffic. But when it comes to backward compatability and overall simplicity, Gigabit Ethernet gets the nod for inter-switch backbone links, industry observers say.

ATM advocate Thomas Nolle, president of CIMI Corp., a consultancy in Voorhees, N.J., points out that switching performance is dependent on the ability of a switched network to hold the traffic at the ingress point until it can be carried through the network.

"ATM's [available bit rate] service targets that problem by allowing net devices to signal among themselves to determine whether there is enough capacity to carry data," Nolle says. "The Gigabit Ethernet camp has got to admit that the strategy of burying collisions and congestion in capacity is intrinsically unreasonable, and some mechanism for end-to-end flow management is absolutely required if you're going to have an effective network."

But Tony Lee, chairman of the Gigabit Ethernet Alliance, says that throwing bandwidth at the problem isn't such a bad idea. "A lot of these problems can be solved by just giving people more bandwidth, without requiring more sophisticated features," he says.

Lee also claims customers will flock to Gigabit Ethernet because they feel comfortable with the technology. "Gigabit Ethernet is really the extension of the most dominant LAN technology," he says. "So it's a logical choice for people to upgrade to Gigabit Ethernet from 10M and 100M bit/sec Ethernet when they need more bandwidth in the backbone."

Also, Lee points out that new protocols are being developed — including Internet Protocol Next Generation and Resource Reservation Protocol — that will bring ATM-like multicast and bandwidth reservation capabilities to the Ethernet-based technology.

But, in essence, it's an irrational debate, Nolle says. "Gigabit Ethernet is like UFOs: I can make all the statements I want to about them with no fear of contradiction because none of them are landing," Nolle says. "And that's the problem with Gigabit Ethernet: You cannot assess a technology you can purchase against one that you cannot."

So 1997 will prove to be pivotal for both technologies, as the industry will get its first look at Gigabit Ethernet products and decide how they stack up against existing ATM gear.

NetWare vs. NT

By Christine Burns

Novell, Inc. will have to don heavy armor this year to defend its network services turf from a Microsoft Corp. assault.

The lines between NetWare and Windows NT have been clear in the past. NetWare screams at file and print, and its directory service provides great manageability for networks of all sizes. NT, while criticized as hard to administer, is considered the best for serving up networked applications.

These lines are blurring, however, as the market moves away from the network operating system (NOS) and toward network services that tie server operating systems together.

Novell has tried to move beyond the NOS realm with IntranetWare. The bundle, introduced in October, pivots on Novell Directory Services (NDS) and includes a Web server, an IP gateway and multiprotocol routing. However, the product has yet to made a huge impact.

"Novell isn't going to open any new accounts with this product. It will find success only as an upgrade," says Steve Kleynhans, an analyst at META Group, Inc. in Stamford, Conn.

But overhauling its 3.5 million installed servers would make a great year for Novell, says William Donahoo, Novell's senior director of product marketing. "That's a huge opportunity, and we are going after that," Donahoo says.

Novell also is taking its most valuable asset on the road by giving away NDS source code to any vendor that wants to integrate it into their products.

A longstanding problem for Novell has been getting developers to write applications that leverage NDS. Novell has made strides in this area by embracing Java and Lightweight Directory Access Protocol.

However, it must combat the promise of Microsoft's NT 5.0 directory service. While the beta is not expected until summer, Microsoft has already released alpha code to 3,500 developers.

"It's a question of whether developers want to write to an up-and-coming directory or one that is trying to break out of a proprietary mold," says Rob Enderle, an analyst at Giga Information Group in Santa Clara, Calif.

"The real benefit of our directory is that it was designed to work with all of the different server applications out there," says Mike Nash, director of server marketing at Microsoft.

Regardless of the wind behind NT's sails, the reality for 1997 is likely to be a mixed operating system environment.

"The solution to this battle is real coexistence," says Dave Carpuccio, vice president of networking technology at Gartner Group, Inc. in Stamford, Conn.

"Let customers use the system that suits their needs, regardless of what is already on their network," he says.

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ISDN vs. ADSL

By Tim Greene

ADSL could have a great year in 1997, and that could mean yet another thorn in the side of a rival broadband technology — ISDN.

Carriers are promising that by the middle of the year, they will offer Asymmetric Digital Subscriber Line (ADSL) Internet access services at 1.5M bit/sec T-1 speeds — and the technology has potential to deliver a whopping 8M bit/sec.

That is all done over standard copper phone lines, the same wiring used to deliver digital, Basic Rate Interface ISDN at a comparatively puny 128K bit/sec.

For users that want more bandwidth than modems deliver just to hop on the Internet and that are willing to pay whatever carriers decide is a fair price, ADSL is the clear winner.

For that matter, if it's available, the same service over a cable modem would offer up to 10M bit/sec over wiring that may already be in place. And, depending on how carriers provision cable modem and ADSL service, the user could also hook in at those speeds to a corporate LAN or intranet.

No ISDN eulogy yet

That said, ISDN is fundamentally different from ADSL and has unique capabilities.

ISDN will continue to have a niche for telecommuters because of its flexibility, says Bob Larribeau, director of the California ISDN users group. With two 64K bit/sec channels, users can add or drop one channel to get more bandwidth for data or to clear up a channel to take a voice call. One channel can also be used for faxing.

"Plus, ISDN is a more secure service. I think circuit-switched networks are much more secure than packet-switched networks," Larribeau says.

ISDN is a switched service, meaning you can call anyone and anyone can call you even though ISDN is digital and the caller might be using an analog phone. The traffic is switched through a standard voice telephone switch that has been enhanced to handle ISDN.

ADSL, on the other hand, relies on the service provider to establish a short list of whom you can connect with. An ADSL line carries an analog voice channel that operates on the same line at lower frequencies than the broadband channels, which are not switched.

As a result, the broadband channel essentially is nailed up 24 hours a day, which may be attractive to users that routinely spend several hours a day online. ISDN typically is billed by usage.

ADSL an easy sell

But ADSL will claim areas where it clearly outstrips ISDN, according to Kieran Taylor, broadband consultant at TeleChoice, Inc., a consultancy in Verona, N.J. "It will offer higher quality videoconferencing and enable transparent LAN and Internet services such as Internet telephones," Taylor says.

Plus, in areas where demand for ISDN is low, ADSL will be the less expensive service to provision. It costs a carrier about $200,000 to upgrade a voice phone switch to ISDN. ADSL can be provisioned a few users at a time for $1,000 to $2,000 per line, he says.

ADSL is a dedicated transport line. It carries lopsided traffic up to 8M bit/sec toward the user and up to 1M bit/sec away.

Network computer vs. PC

By John Cox

In 1997, we'll find out if the so-called network computer will be a major presence on a lot of corporate desktops — or the computer industry's equivalent of the pet rock fad.

"Network computer" is an ambiguous term. In practice, it usually means a low-cost desktop device designed to download and run Java applets and access Web servers. Another variant displays Windows, Unix and mainframe applications running on remote servers and accesses the Web. Some will do both.

In short, they're devices that rely heavily on networked servers for operating system functions, file management, storage, data processing, and other features that one usually associates with Intel PCs loaded with Windows and a raft of single-user applications.

Thin clients give corporate MIS an alternative to the Wintel PC as the application delivery medium. The question that likely will be answered this year is, how many corporate users need a full-blooded PC and how many don't?

"There are going to be some limitations just by the nature of the [thin client] design," says Dennis Bosma, MIS director at Kahler Realty Corp. in Rochester, Minn. But, he adds, most desktop users only run two or three applications, such as word processing and E-mail, so the extra power that a desktop PC offers is unneeded in most cases.

"Wouldn't you rather have one or two desktop PCs and 40 network computers at a third of the price [of all PCs]?" he asks.

It seems likely that applications where information is highly structured and where users interact with it in formal ways will be the initial candidates for thin clients. Today, many of these applications are used by millions of clerical and data entry workers on 3270 or 5250 terminals. But they could also be executives who run prepackaged, forms-oriented decision-support applications.

Most of the thin-client devices are just now starting to arrive on the market. Initially, it's likely that for some advanced Web functions, the thin clients will trail Wintel PCs running Web browsers. But that deficiency isn't expected to last long.

Several trends favor thin-client computers. One is the rise of the Internet/World-Wide Web as a standard means to access, view and download information. Another is the maturation of corporate networks in terms of manageability, reliability and adequate bandwidth. A third is the somewhat slower maturation of distributed object technology.

Working against thin clients is the surging demand for laptop computers. Laptop users by definition are at least sometimes disconnected from the network; they need local storage and processing — they need a PC.

Finally, there is a powerful psychological anchor. Many PC users may think, "It's my data, my applications and my personal computer, and no one is taking them away from me."

"I think [moving to thin clients] is going to be a long way off for a company our size, just because of the logistics of it," says an Internet specialist, who asked to remain anonymous, at an international pharmaceutical company with 20,000 employees.

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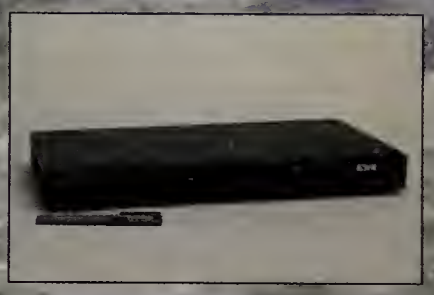

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Microsoft vs. Netscape

By Carol Sliwa

The browser battle between Microsoft Corp. and Netscape Communications Corp. was all the rage in 1996.

But in '97, Netscape is aiming to shift the focus to its "killer app," a Web-based E-mail/groupware product called Communicator, and its SuiteSpot server software line.

In its quest to grab 50% of the lucrative intranet market space by the year 2000, the Mountain View, Calif., upstart will find yet another Goliath waiting at its doorstep: IBM/Lotus. But taking on the likes of Lotus Notes and Microsoft's BackOffice doesn't seem to faze the 33-month-old company.

"With the rise of the 'Net and the importance of compatibility with the 'Net, we think the timing's perfect for us to slide in there," says Mike Homer, Netscape's senior vice president of marketing.

Netscape's goal is to become one of the top two E-mail players over the course of the next year, Homer says. He claims customer research shows that with 11 million E-mail users, Netscape is No. 3, behind leaders Lotus and Microsoft.

A daunting task? "Of the companies in this space, the two that I wouldn't want to challenge are IBM and Microsoft," warns Rob Enderle, a senior analyst at Giga Information Group. "If they get really ticked at you, they can throw more resources at the problem than you would have total revenue."

Despite Netscape's expansion plans, the browser battle is not over, at least according to Microsoft. "I think others are trying to claim that the browser war is over because we're gaining," says Brad Chase, vice president of developer relations with Microsoft's applications and Internet client group.

"It's still very important to be the premier provider of the Internet client, if you will, and I think the browser is probably the most important part of that whole package," says Yusuf Mehdi, group product manager of Microsoft's applications and Internet client group.

The Redmond, Wash., software giant will be striving to overtake market leader Netscape in browser share, Mehdi says. In 1997, the company plans to have its browser integrated into its Windows operating system. And through Microsoft's Active Desktop, users will be able to get Web pages and software updates pushed to their desktops. Netscape plans to compete against Active Desktop with a Communicator component code-named Constellation.

So the two arch nemeses, once again, will be going head-to-head in the Internet client space. And they'll tangle on the intranet software infrastructure front, as well. But with a far broader product line, Microsoft will have more tentacles extending into both the corporate and consumer space.

IXCs vs. LECs

By David Rohde

Every multibillion-dollar telephone company in the U.S. can give you a thousand reasons why they should become the end-to-end carrier of the future. But when you come right down to it, they each have one big thing going for them — and one strike against them.

Industry observers agree: The regional Bell operating companies should have an easier time establishing long-distance operations than the long-distance carriers establishing local operations. It's simply a lot easier to become a long-distance carrier — just buy capacity from another carrier — than to endure the hellish process of building a local network from the ground up.

"It should be far easier for RBOCs to roll out interexchange long distance than for the AT&Ts and MCIs to get into the local market," says Jeff Hafer, telecommunications manager at GPU, Inc., a utility holding company in Reading, Pa.

But when it comes to providing actual services — especially broadband data services — from end to end, the same industry observers say the long-distance carriers should do better than the RBOCs. Why? Because, well, they're not RBOCs. They have more experience and far more market share in services such as frame relay and virtual private networks — and less of a reputation for fuddy-duddiness than RBOCs.

In fact, firms such as Marriott International, Inc. and Kraft Foods, Inc. have already given AT&T an effective end-to-end yoke over their networks through Accu-Ring. On behalf of the customer, AT&T leases Synchronous Optical Network (SONET) capacity from the local RBOC or competitive local carrier that runs directly from the customer premises to the AT&T point of presence.

Stalemate

The biggest fear is that neither side will be able to gain an advantage in 1997 because of continuing legal disputes in the telecommunications industry.

Despite disputes, carriers have to work together. For example, when AT&T and US WEST, Inc. got into a shouting match last spring over their local interconnection negotiations, did they cut each other off? Not on your life. Without US WEST, AT&T cannot originate or terminate its customers' calls to 14 states, and AT&T is US WEST's (and every other local carrier's) largest customer. In the third quarter alone, AT&T paid US WEST more than $700 million in access fees.

Carrying on public disputes while maintaining a huge dollar relationship behind the scenes is not a good sign for users, according to analysts. Reckless attacks on policy matters typically indicate positioning in a legal fight rather than an existing battle for customers, according to Robert Rosenberg, president of Insight Research Corp., a consulting firm in Livingston, N.J., and a longtime observer of the telephone industry.

"These guys have never met in the marketplace," Rosenberg says. "The only place they compete is in a government administrative forum or in a courtroom."

So don't spend too much time praying for one side or the other to win the forever-anticipated battle for end-to-end business. Instead, simply pray for one or the other merely to have the chance. To do that, telecommunications reform will have to get out of the courts and onto the streets — one of the biggest challenges in the industry as the calendar rips open to 1997.

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ELVIS LIVES AT ELI LILLY

Intranet effort has pharmaceutical king rockin'.

By John Cox

An Eli Lilly and Co. marketing manager in the U.K. has a problem: A European relief agency is considering Lilly's Prozac antidepressant drug for use in a post-traumatic stress treatment plan for war refugees. But he's not convinced the drug is safe.

The manager fires up the Web browser on his PC and taps into ELVIS, the Eli Lilly Virtual Information System. With a few clicks, he's into the Prozac Information Network area, where he finds a list of all Prozac clinical trials being conducted around the world, along with preliminary results. He selects several documents and also finds two speakers who will address this problem at an upcoming Southeast Asian medical congress. He combines that with a white paper prepared by Lilly's medical staff.

He downloads the lot and sends it to a laser printer. In just a few minutes, he's armed with a wealth of medical information and resources that he can hand over to the prospective customer. In the past, it would have taken days and endless rounds of overseas faxes, phone calls, overnight parcels and E-mail to track down a fraction of this same information.

Indeed, ELVIS has Eli Lilly rocking. And it has earned the company honors as cowinner of the 12th Annual *Network World* User Excellence Award.

ELVIS was kind of a guerrilla network, with the first spark of interest coming in the fall of 1993 at the grassroots level of the MIS organization. There were no "business

TOM GALLIHER

Networking

USER EXCELLENCE AWARDS

case" or "return on investment" considerations made. There was only a conviction that Web browsers and Web servers, on a TCP/IP backbone with adequate firewall protection, had the potential to trigger an explosion of activity among Lilly's various business units.

And that's just what happened. Week by week, business managers are finding new uses for ELVIS, which is becoming an information utility as indispensable as the telephone.

ELVIS is now widely seen as the primary pipeline to accessing almost any kind of information Lilly employees need for their work. Its success is prompting MIS to look at adopting a so-called thin-client, or network computing, approach — gradually replacing PCs with less costly, browser-equipped desktop machines that download the software they need from networked servers.

And MIS programmers are at work making ELVIS more dynamic, allowing users to download small programs in the form of applets or software components.

But with success, there are new challenges. Lilly is working on criteria for what kinds of information should be put on ELVIS, clarifying the responsibilities of information "owners," and creating guidelines for building Web pages that download efficiently and can be easily navigated.

By all accounts, the person responsible for launching what became ELVIS is John Swartzendruber, an information consultant in Lilly's corporate MIS group. In 1993, he heard about the early Mosaic Web browser, and a colleague suggested it might be useful for Internet access. He downloaded the public software and began playing with it.

"It hit me that it was so seamless, whether you were accessing internal or external information, that we could put up our own internal Web servers on these systems," he says.

With the help of a couple of colleagues, Swartzendruber in the fall of 1993 started demonstrating Web systems to an array of business unit managers, corporate executives and MIS managers whom he thought could see the potential. "I said to them, 'Show me the business need, and I'll build you something slick,' " he says.

In June 1994, he built a small pilot Web site for Lilly's scientific research group. Scientists centrally stored research information that could then be accessed with a Web browser. By that fall, Swartzendruber got clearance to establish an internal Web for the group. By early 1996, ELVIS had received MIS backing and funding.

Last May, ELVIS was formally launched. The newly formed Internet Systems Group (ISG) worked with various Lilly departments and business units to set up Web servers, design custom Web pages underneath the ELVIS home pages and pack the servers with HTML documents.

Lilly employees lacked the in-depth Unix experience found at Web pioneers such as Sun Microsystems, Inc. Without that experience, "unless we took a more systematic approach, avoiding haphazard growth, we'd soon be in big trouble," Swartzendruber says.

Most of the work has been done by ISG, headed by Swartzendruber. ISG, with its budget of about $1 million, is the software provider and coordinator for ELVIS. "We organize the top-level Web pages —the home page and the series of pages at several levels below that," Swartzendruber says. "There's a methodology on how to organize your data so people have a hope of being able to navigate it."

"You need good content and relevant content, and you need to understand who your audience is," says Merav Bodick, senior scientific systems analyst in the Global Business Unit Information Technology Group. The first target for Bodick was to identify and then automate business processes that are well suited to Web technology.

The man behind ELVIS: *Swartzendruber: Enamored with the Mosaic Web browser, in 1993 he told Eli Lilly managers, "Show me the business need, and I'll build you something slick."*

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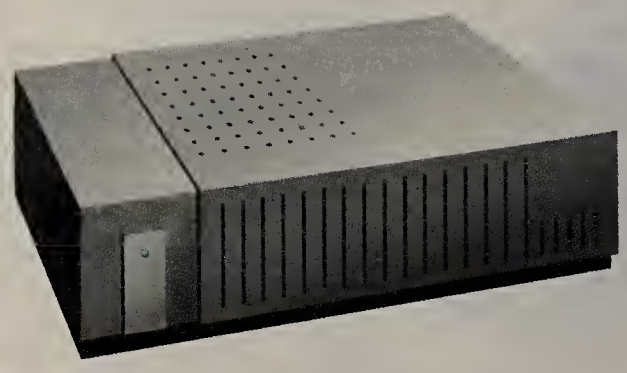

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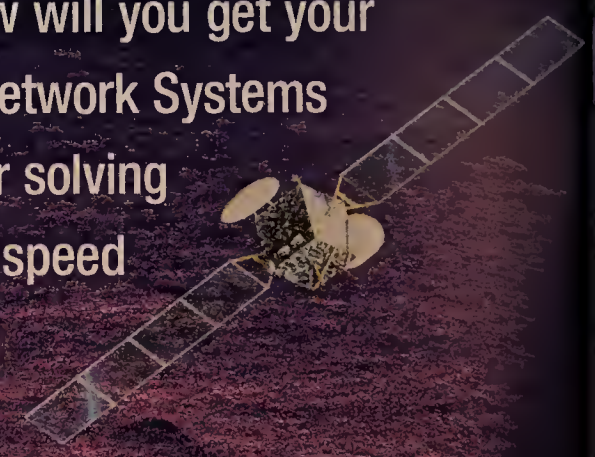

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Circle Reader Service #5

For example, Lilly offices in other countries (called affiliates) used to order promotional materials through a combination of paper and electronic catalogs, filling orders and faxing them to suppliers. Bodick's group changed all that by creating an ELVIS-based system that lets affiliates select what they want and place the order with their browser. "It's not so much the 'coolness' of the interactive program, but the business value that's important in Web applications," she says.

The Web-based online ordering system lets affiliates see exactly what's available through scanned images of the products. PERL scripts generate E-mail messages to appropriate supervisors and other departments when orders are placed. And supervisors can track order status via ELVIS, making for a much more efficient ordering process. "It's a very quick and simple solution to this problem," Bodick says.

Other groups are now clamoring to use the ordering system, which can be easily redeployed via ELVIS.

ISG is also a facilitator for MIS professionals like Bodick who work with various business units, making for a difficult juggling act that requires sensitivity. "There's a fine line between guiding people and [just] telling them what to do," Swartzendruber says. "If you impose too much structure, you lose spontaneity and creativity."

Lilly has become a hotbed for both since ELVIS became available. One of the first users of the Web was the marketing department for Lilly's Neuroscience Business Unit, which works with

The combination *of ELVIS and a Documentum document management system has proven to be powerful, Roth says. "As we started to put these documents out there via the Web, the interest in document management has blossomed."*

Lilly affiliates in 106 countries to market various drugs, with Prozac probably being the most well known. Bryan Allison, a marketing associate for the business unit, says in the past, headquarters created, collected and distributed — via a blizzard of mail, overnight packages, faxes and phone calls — a mass of marketing information related to these drugs.

With a server scrounged from under someone's desk and help from Swartzendruber, Allison's team created their Web site, NeuroNet, on ELVIS, and packed it with documents. "With ELVIS, we now just post the updated information centrally, and the affiliates can access it when and where they need to," Allison says.

Besides giving affiliates faster,

With a server *scrounged from under someone's desk, Allison's team created an ELVIS site called NeuroNet. "It wasn't developed to save money," he insists. "It was developed to enhance communications."*

more direct access to a broader array of information than ever before, ELVIS has cut deeply into the roughly $35,000 per month Allison used to spend on overseas communications. "But it wasn't developed to save money," he insists. "It was developed to enhance communications. . . As we continue to globalize Lilly [that is, opening new markets and offices around the world], communications has been a huge issue."

Other groups were quick to see the benefits of linking to the Web with existing corporate servers. Scientists at Lilly Research Laboratories must follow a maze of government regulations regarding drug development and manufacturing. Many of these were held in an electronic document management system, Documentum, Inc.'s Documentum. But notices of changes and new procedures were circulated largely by hand in three-ring binders. And scientists who needed this information had to struggle with a Documentum interface intended for experts.

"I know of one case where it took someone two weeks to find the answer to a question," recalls Suzette Roth, a scientific information analyst for the laboratories' MIS group.

A year ago, in one of the first business uses of Web technology, Roth and colleague Eric Wolf worked with Procedures Associate Debra Swain to create a Web link to specific Documentum libraries. Users now log onto the Web site and download a form, which displays several search criteria. Clicking on one triggers a Common Gateway Interface (CGI) script that interacts with the Documentum server and displays the desired documents.

"These users don't need an account number or password, and it's made it a lot easier for people who need to see those procedures," Swain says.

"As we started to put these documents out there via the Web, the interest in document management has blossomed," Roth says. Various groups, from training specialists to toxicologists, are now clamoring to get documents into Documentum for control and onto ELVIS for access.

Information once scattered in paper form, electronic libraries and scores of separate PC hard drives are now being brought together, simply because it is possible to access it via the Web.

This plethora of Web projects among the business units forms a mosaic, a larger pattern, that is just now emerging and guiding Lilly's MIS management.

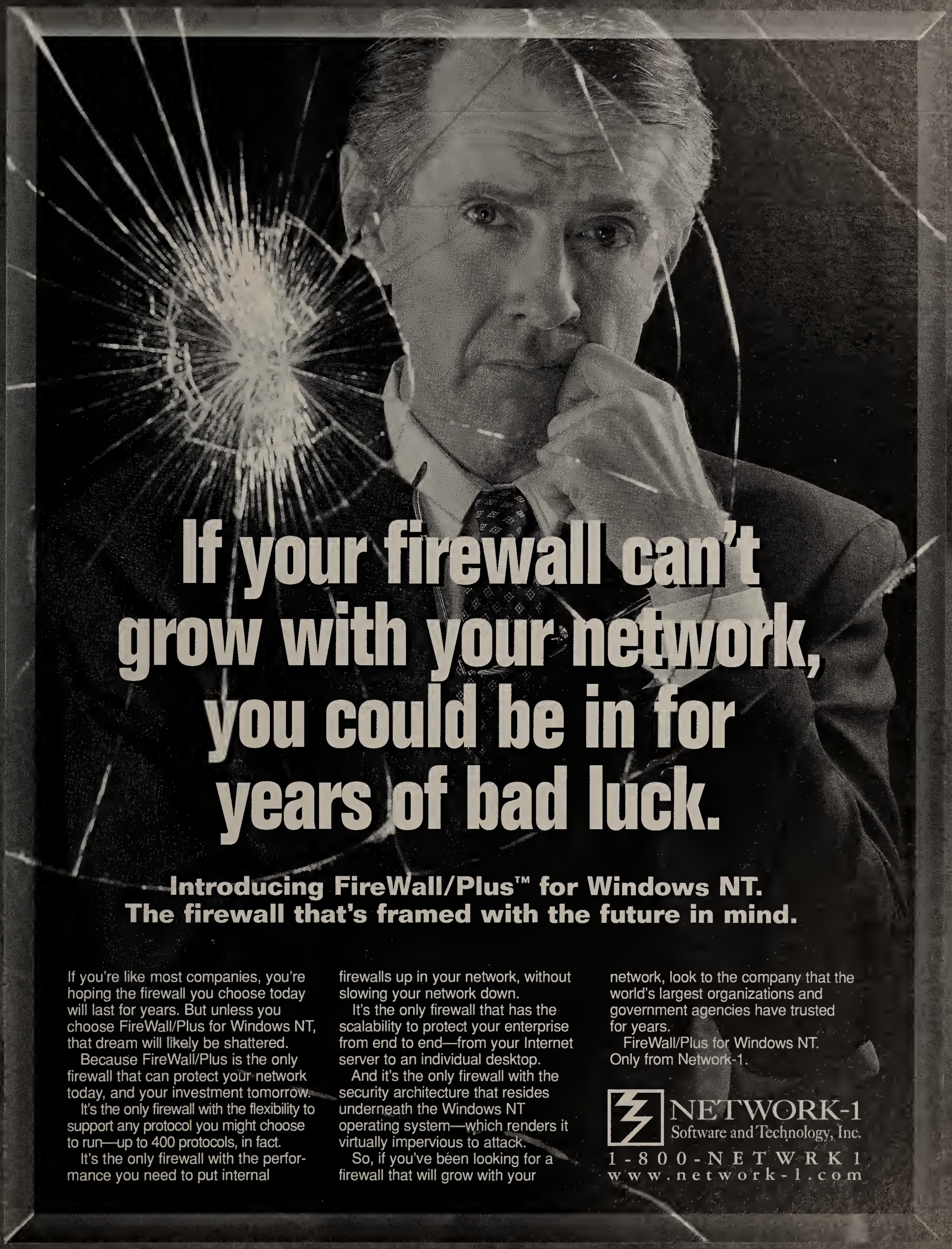
"Originally, my dream for the Web was that it would be a platform-independent way to share information across the corporation," says Edward Tunstall, information officer for strategy and planning. "Today, my dream is that the browser becomes the desktop. To roll out new applications, all I have to do is change it on the server. It will simplify application rollout, training and maintenance."

"It's not *so much the 'coolness' of the interactive program, but the business value that's important in Web applications," Bodick says.*

Tunstall sees ELVIS becoming a utility, like the telephone. Upper management is already using it that way. For example, when Lilly's chief financial officer recently broadcast earnings results to employees via closed-circuit television, he noted that complete figures were on ELVIS. After fielding phone and fax questions for a while, he announced remaining questions would be answered and posted on ELVIS.

Such a utility, like the phone, is indispensable. With that in mind, Tunstall says ELVIS now needs to be

ELVIS: A LOGICAL ROAD MAP



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"ELVIS is *not yet considered mission critical, but it will be within a year," Tunstall predicts.*

turned over to an operations group with expertise in Unix systems management, backups, online support and other services. "ELVIS is not yet considered mission critical, but it will be within a year," he predicts. "If I can get our executives to be able to access corporate databases from a Web browser, then ELVIS becomes mission-critical."

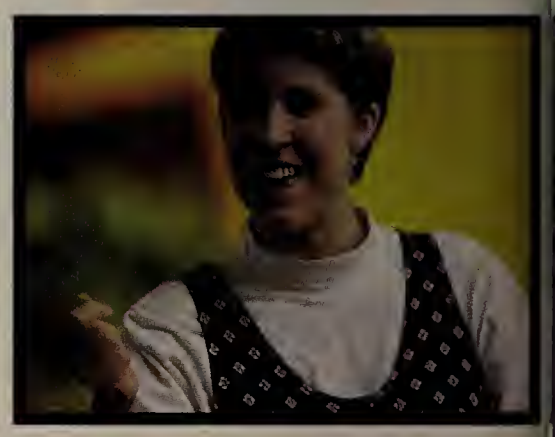
For such a critical application, ELVIS takes up little network bandwidth. Lilly already had a strong TCP/IP-based corporate backbone, and managers estimate ELVIS takes up only 2% or 3% of total bandwidth. So far, it's had little impact on network operations.

ELVIS ESSENTIALS

Corporate backbone:	Router-based TCP/IP, migrating to switched ATM
Current users:	15,000 worldwide
Browser:	Netscape Navigator
Number of servers:	3 main servers, 50-70 others worldwide
Server platforms:	Windows NT and Unix; Netscape
Hits:	About 120,000 daily
Access to corporate databases:	Mainly via CGI scripts

And Lilly is moving from a router-based net to a switched ATM net, which will only benefit ELVIS, says Kent Supancik, senior systems analyst for the telecommunications group. "There will be lower latency and higher availability of the net," Supancik says. Also, the telecom group plans to buy more network managment products and deploy these with Web interfaces.

At Lilly, the Web is a true enabler. The communications and display standards, the inexpensive Web server software and the simplicity of the Web



Swain helped create *an ELVIS facility for digging out government regulations and procedures. "It's made it a lot easier for people who need to see those procedures," she says.*

browser as a user interface, create the means by which relatively unsophisticated computer users can collect, store and, most of all, access the information they need to do their jobs.

"Our most immediate problem was sharing our information internally," says Martin Haslanger, president of Sphinx Pharmaceuticals, a Lilly subsidiary charged with drug discovery and development. "In the past, we could never agree on a uniform platform to do that. ELVIS was a tool that solved that. As soon as John Swartzendruber put it out there, it began to show us what we wanted to do."

Beyond that, he says, ELVIS has "finally opened the door for our scientists to the outside world." No one at Lilly sees that door closing again. ■

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9. Learn how pricing structures differ among carriers and how you can take advantage of these differences to obtain the best service bargain
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11. Learn about new and likely future service enhancements which could impact your network
12. Examine your existing carrier and services features to see if they are best suited for your current and future network requirements

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USER EXCELLENCE

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AWARDS

MISSIO acc

Financial services giant Bear, Stearns puts stock in virtual LANs to groom net performance, buck up backup facilities.

By Charles Bruno

(Left to right): *Don Henderson, Ken Starkey, Jeff Marshall and John Kain.*

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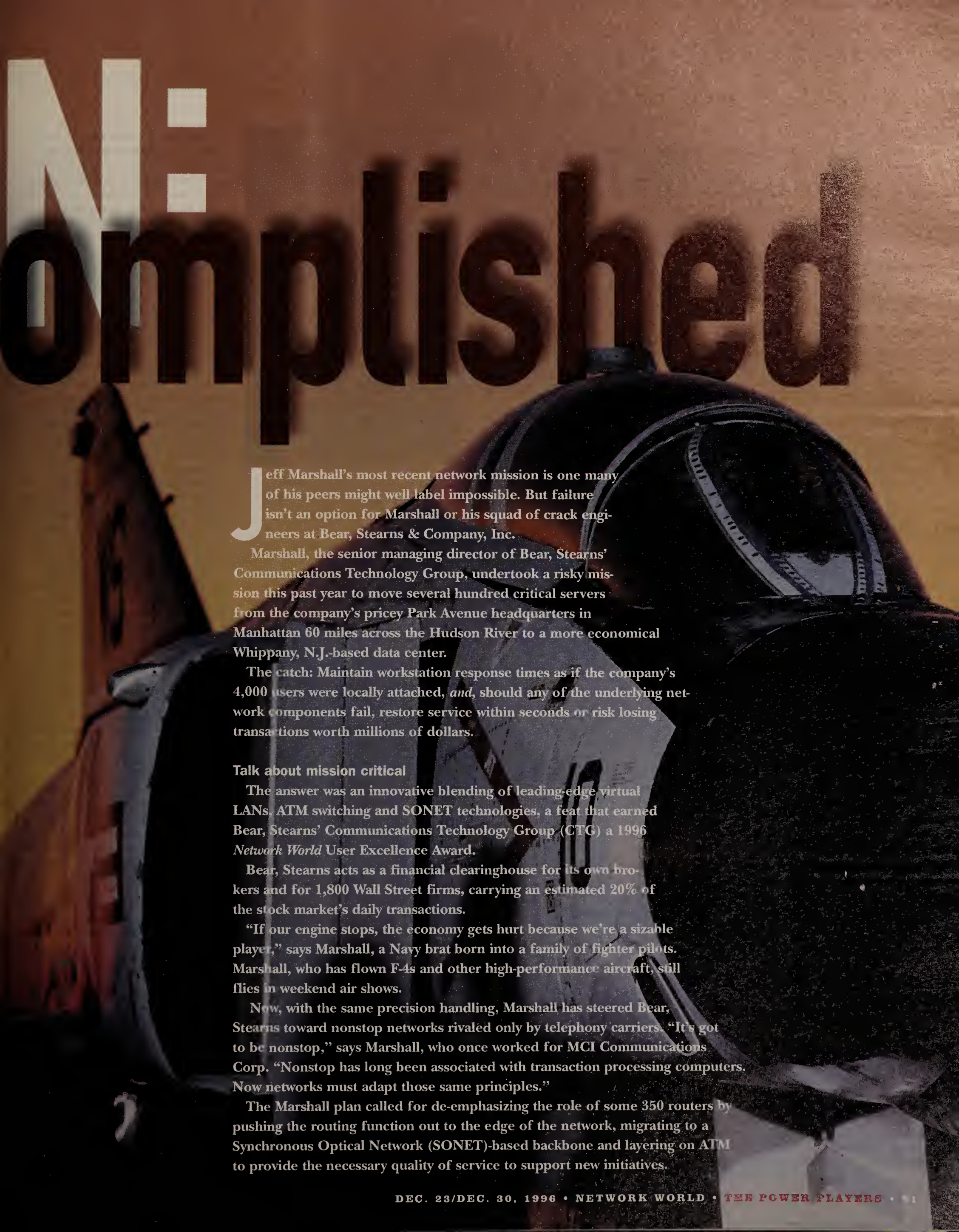


Jeff Marshall's most recent network mission is one many of his peers might well label impossible. But failure isn't an option for Marshall or his squad of crack engineers at Bear, Stearns & Company, Inc.

Marshall, the senior managing director of Bear, Stearns' Communications Technology Group, undertook a risky mission this past year to move several hundred critical servers from the company's pricey Park Avenue headquarters in Manhattan 60 miles across the Hudson River to a more economical Whippany, N.J.-based data center.

The catch: Maintain workstation response times as if the company's 4,000 users were locally attached, *and*, should any of the underlying network components fail, restore service within seconds or risk losing transactions worth millions of dollars.

Talk about mission critical

The answer was an innovative blending of leading-edge virtual LANs, ATM switching and SONET technologies, a feat that earned Bear, Stearns' Communications Technology Group (CTG) a 1996 *Network World* User Excellence Award.

Bear, Stearns acts as a financial clearinghouse for its own brokers and for 1,800 Wall Street firms, carrying an estimated 20% of the stock market's daily transactions.

"If our engine stops, the economy gets hurt because we're a sizable player," says Marshall, a Navy brat born into a family of fighter pilots. Marshall, who has flown F-4s and other high-performance aircraft, still flies in weekend air shows.

Now, with the same precision handling, Marshall has steered Bear, Stearns toward nonstop networks rivaled only by telephony carriers. "It's got to be nonstop," says Marshall, who once worked for MCI Communications Corp. "Nonstop has long been associated with transaction processing computers. Now networks must adapt those same principles."

The Marshall plan called for de-emphasizing the role of some 350 routers by pushing the routing function out to the edge of the network, migrating to a Synchronous Optical Network (SONET)-based backbone and layering on ATM to provide the necessary quality of service to support new initiatives.

Router complexity

Bear, Stearns' router network consists of 170 devices used to link 4,000 users in the metropolitan New York area, and another 180 machines that handle data feeds from associated trading firms and suppliers of stock market data.

CTG's engineers, however, have become disenchanted with routing, largely because of support issues: Costs for memory and software upgrades have grown heavy, and it is increasingly hard to keep all the various versions of code in synch.

"Our core business isn't maintaining and upgrading routers," says John Kain, vice president of engineering. "It's developing state-of-the-art trading systems."

Marshall adds: "If some trader has to execute a billion-dollar transaction on a Cray 100 miles from where he's sitting, the last thing you want to worry about is a damn router."

The combination of support costs, latency and the allure of cheaper, less complicated switching is driving CTG away from the router backbone to a switching core.

Today, the international router network is largely being dismantled. Of the 170 Bay Networks, Inc. routers that had served Bear, Stearns internal customers, just 20 will survive. Of those, 10 will act as feeder nodes, passing traffic on to a switching backbone, while the rest will be kept around in case any of the active routers crash.

The 180 routers that link third-party trading partners and information suppliers will remain intact, Marshall says.

Foundation was there

At about the same time CTG began to sour on routing, the company was building a high-performance, bidirectional switched, metropolitan SONET ring to get ahead of constantly swelling router bandwidth needs. This backbone would ultimately become the centerpiece of Marshall's nonstop network vision.

"We wanted to put in as much open bandwidth as we could," Marshall says. The goal was to free up CTG engineers to tackle larger issues than bandwidth consumption. "We didn't want to spend precious resources on upgrading our bandwidth month by month," he says.

So using circuits laid by Metropolitan Fiber Systems, Inc., Bear, Stearns built a SONET loop from its headquarters at 245 Park Ave. to a company data center in Whippany, back across the river to Brooklyn and into the company's MetroTech facility — a back-office trading center — and then back to Park Avenue.

The net provided 2.4G bit/sec (OC-48) of capacity, which will effectively double by the end of 1996 when the company nails up a second OC-48 loop, providing nearly 5G bit/sec of total capacity.

The second loop will provide the bandwidth needed to accommodate the server relocation to Whippany and to cover application growth — slices on the existing OC-48 are already at or near capacity.

To guard against outages, the SONET ring is bidirectional, providing alternate paths in the event of a switch or circuit failure. Bear, Stearns hasn't experienced a single transport-related outage since the redundant net was deployed, says Ken Jones, vice president of engineering. The ring has even survived traffic accidents that knocked down telephone poles and left cable hanging.

"It's solid as a rock," Jones says.

In the three years since Bear, Stearns built the SONET net, it has saved $8.1 million in transport costs otherwise paid to carriers. Over the projected five-year period in which CTG has laid out its project costs, the SONET net is expected to save $13.5 million (see graphic, page 84).

Out on the farm

With the SONET net in place in mid-1993, Bear, Stearns began to tackle larger network issues. The firm's Park Avenue data center, for instance, had long ago outgrown its space, and CTG harbored concerns about its headquarters site as a data center. Utility and railroad tunnels beneath the building posed the risk of power outages and other mishaps. Not to mention skyrocketing real estate costs.

So CTG seriously began to consider moving company data servers to the Whippany data center.

There was another reason to corral servers at Whippany: Hundreds of NetWare, Windows NT Server and Unix hosts peppered the Bear, Stearns distributed computing landscape, and the company thought it could provide greater backup and redundancy by centralizing servers.

But the company had misgivings about the idea because it had some experience trying to link Manhattan-based clients to Whippany servers via 100M bit/sec High Speed Serial Interface (HSSI) links. PC-to-server response times suffered over the HSSI connections. Moreover, in the event of router or circuit outages, users would be down anywhere from 3 to 4 minutes until a workaround was established — an unacceptable delay.

ATM, the engineers believed, would let them backhaul client traffic to data center servers across the WAN without affecting response times. There was little to lose. A voluminous traffic pattern study had shown that the routers and 48 associated subnets were dragging down performance, says Don Henderson, associate director of new technology, network engineering and implementation within CTG.

Applications were "just blowing the bandwidth out," Henderson says. "We needed to balance traffic to improve local performance and understand the total bandwidth aggregation."

So CTG built an ATM network on top of its SONET ring. It planted General DataComm, Inc. DVB2 Apex ATM switches in strategic locations to siphon traffic off the router net. On the local premises side, Bear, Stearns turned to its old router provider, Bay Networks, Inc. CTG began to deploy Bay Ethercell/Lattiscell ATM switches, replacing individual subnets and providing larger slices of bandwidth to client workstations as needed.

But before long, CTG discovered it had a problem with the workgroup switches. Bay's Ethercell/Lattiscell equipment relied on the LAN Emulation standard to set up sessions with the remote servers over the ATM net. That's when CTG learned that LANE doesn't scale particularly well in networks with thousands of nodes.

Moreover, in the event of an outage, the best CTG could do was restore the failed link or switch in 4 to 8 minutes — which was actually worse than the 3 to 4 minute restoral times it could achieve with the router network.

CTG also started to see the number of switched virtual circuits (SVC) it used go through the roof. "We had so many virtual circuits in the network, they brought down the performance," Henderson says.

With LANE, every LAN emulation client requires five SVCs — one for data and four overhead SVCs that are largely used to query security servers, route servers and other devices needed to establish the emulated link. CTG quickly learned it would be using almost 4,000 SVCs for a section of a single subnet, and if LANE was rolled out companywide, it could easi-

ADVICE FOR VLAN NOVICES

Develop a baseline for testing. You need to understand the performance of your shared-media environments vs. the switched nature of virtual LANs.

Test everything. Don't take vendor claims as fact; test their gear in your own environment and with your own traffic loads.

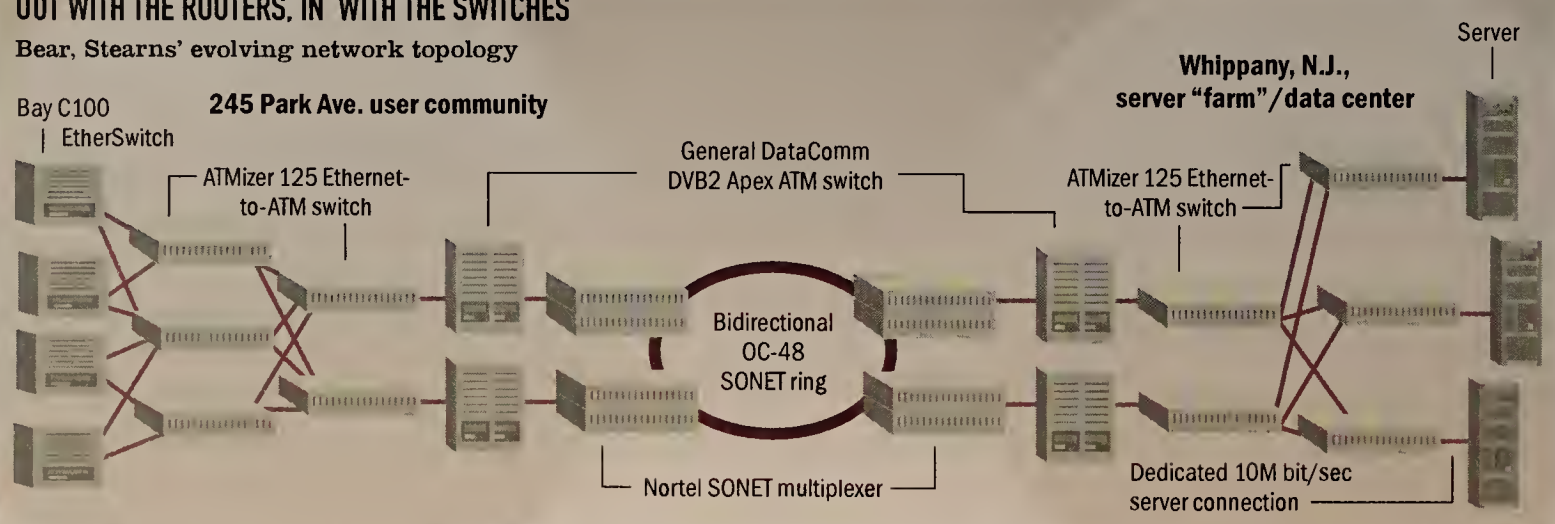
Recalibrate net management. Manage systems, not the network as a whole. Manage your ATM switches separate from your net servers and SONET gear. Look for correlations between like devices. Develop trend data and use it to spot irregularities.

Understand VLAN switches and their limitations. Some VLAN switches require you to tie user IP addresses to specific switch ports, while other devices can proactively sense new users and assign them to virtual subnets.

Upgrade meticulously. Switch software changes should be tested in detail; simulate failures on every port to make sure the upgrade works.

OUT WITH THE ROUTERS, IN WITH THE SWITCHES

Bear, Stearns' evolving network topology



The combination of virtual LAN and ATM switches recovers from outages in 15 seconds, vs. 4 to 5 minutes for Bear, Stearns' router-based network.

SOURCE: BEAR, STEARNS, NEW YORK

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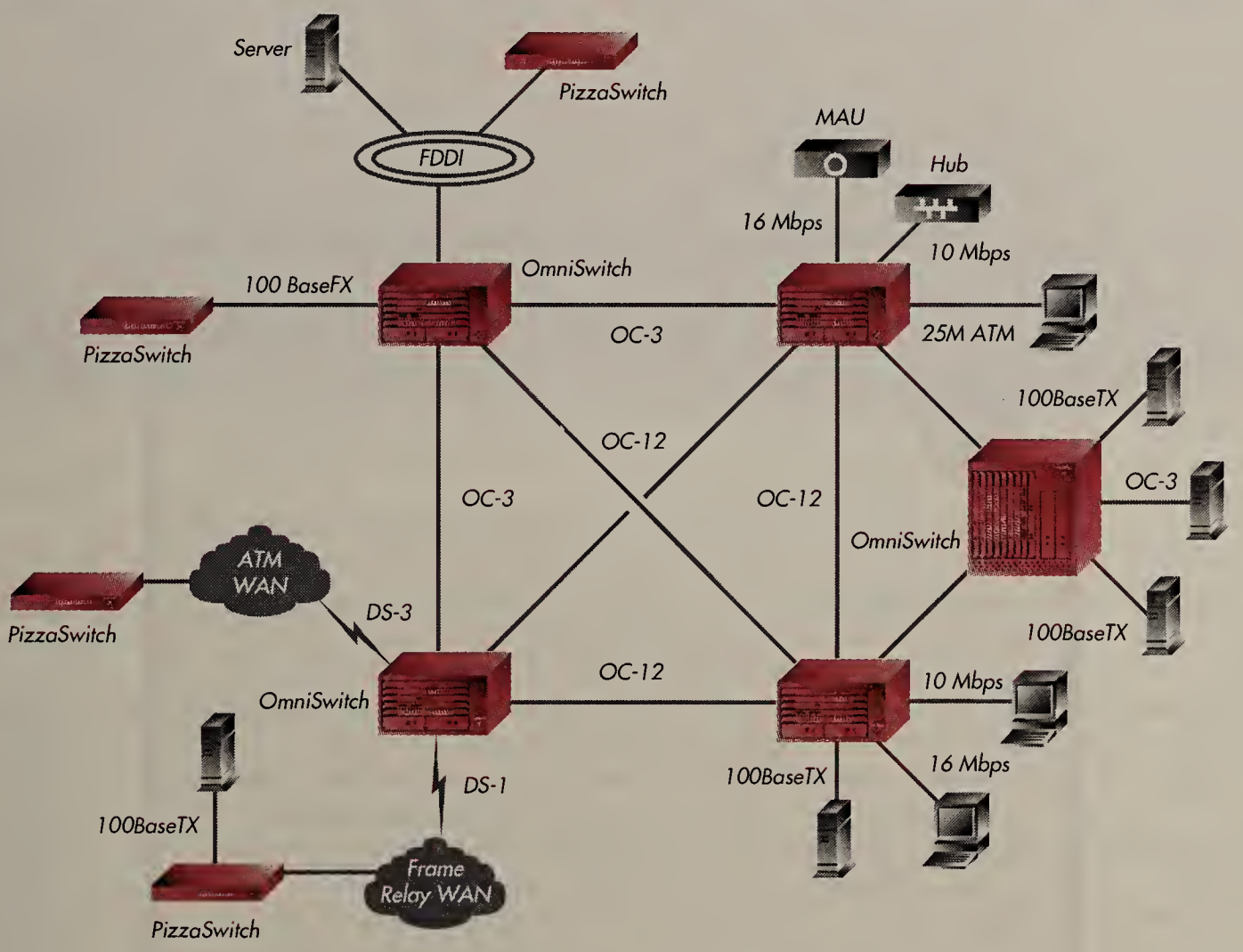

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ly have chewed up 150,000 SVCs.

"We'd have built so many SVCs, we'd have burned away all of our bandwidth," Henderson says. "We knew this wouldn't work unless we adopted some proprietary method of consolidating the SVCs."

Lacking confidence in the SVC approach, CTG pushed its Whippany server plans to the back burner.

After the setback, Henderson and others examined the situation. "We needed technology that could set policies, handle filtering, support broadcast suppression and offered the intelligence to adapt to changing conditions," he says. "We ended up agreeing we needed VLANs."

Bear, Stearns could have been in a pickle had it not been for CTG's practice of developing parallel technologies in its lab. When it soured on using the Ethercell/Lattiscell switches, it quickly turned to Agile Networks, Inc.'s ATMizer, an ATM switch with advanced VLAN capabilities.

The ATMizer was largely an unknown to many users, and VLANs were just emerging. But Henderson and his cohorts had had the device in the lab for almost a year.

Added agility

Lab testing proved the ATMizer could scale on the order Bear, Stearns needed, and it also showed a hybrid ATM/VLAN switch could work around failures in a flash. Confident the switches would work, Bear, Stearns began an aggressive rollout.

Since June, CTG has deployed 35 Agile ATMizer 125 ATM/VLAN switches between 245 Park Ave. and Whippany. Henderson says the firm will deploy another 25 devices in MetroTech and other Bear, Stearns facilities in the New York area.

On the wide-area side, the ATMizers feed into the DVB2 ATM backbone switches (see graphic, page 82). On the local side, the ATMizers connect to Bay Networks C100 Ethernet switches, which provide 10M or 100M bit/sec support to attached client workstations.

One of the big advantages of moving to the Agile switch, Henderson says, is that it is very protocol-aware and has the intelligence to recognize protocol types and handle them according to priority parameters.

The ATMizer, for instance, is smart enough to recognize whether an IPX stream comes from a workstation or a server. If it detects a server stream, the switch will send full Server Advertising Protocol and Routing Information Protocol routing updates — instead of sending them to both servers and clients. "That dramatically cuts down on the broadcast needs of your workstations," he says. "It's a really classy feature."

The switch comes with auto-learning IP. When you plug a new IP device into the switch, it listens to the device's broadcasts and records the preferred destination server. The next time a user logs on, the switch sticks the user on the same virtual subnet.

Another advantage of the ATMizer is that it does not support the LANE specification and its associated SVC overhead, but instead multiplexes client feeds into a single LAN emulation client — so it makes the feed look like one emulation client instead of 10, thereby economizing on the number of SVCs required.

"It's a much smarter use of our SVC resources," Kain says.

"The fact that you have fewer SVCs allows for a faster reroute," Henderson says. A complete switch failure requires just 15 seconds to route around to another switch, while a single Ethernet port failure bounces back in 5 seconds.

"You don't drop your TCP sessions, and that's what keeps people around here happy," Kain says.

Solving the failure issue was a "huge step," CTG's Jones says. With that issue resolved, CTG then got on with its job of moving strategic servers to Whippany. At present, the company has relocated about 50 to 60 servers, with another 30 to 40 targeted for Whippany — plus any new servers that come online automatically are tethered to the Whippany site.

By the end of next summer, CTG expects to support between 200 and 250 servers at the location.

"The key here is that we now have the networking infrastructure in place to support all of our servers, as they are moved over," Henderson says.

The relocation of the servers to New Jersey from Park Avenue, where real estate is going for about $25 per square foot, is also saving the company about $750,000 per year.

The next step

Marshall is satisfied that his team has solved the wide-area riddle of extending servers without compromising response times. But more importantly, he believes the move to VLANs signals a major opportunity for the company to extend the technology on a global basis and guarantee the nonstop networking he champions.

"We now have the opportunity to expand this into a much broader world — a virtual, relational campus cloud," Marshall says. He foresees an infrastructure where VLANs proliferate across the company's international sites, driving routing out of the core of the Bear, Stearns network and relegating routers to access device status at the edge of the net.

"One of the problems with routers is one burp can shut down enormous processes in a company," Marshall says.

"The one message I want to get out is that flatter switched networks are easier and more manageable," he says.

Marshall empathizes with peers who have massive amounts of capital tied up in expansive router networks.

"They feel like they are at the end and they are about to die," Marshall says. "But I'm here to say there is a next step, and we're already there." ■

BEAR, STEARNS' FIVE-YEAR PROJECT COST ANALYSIS

Network components	Monthly fees for carrier-provided facilities	Monthly fees for Bear, Stearns' private net	Monthly savings	Projected savings over 60 months
WAN circuits	$275,000 (48 DS-3s)	$50,000 (MFS leased fiber)	$225,000	$13.5 million
Time-division multiplexers	$25,000	$25,000	$0	$0
Total	**$300,000**	**$75,000**	**$225,000**	**$13.5 million**

Relocating a Bear, Stearns data center from 245 Park Ave. in New York to Whippany, N.J., will save an additional $2.25 million over 60 months, bringing total project savings to $15.75 million. Project expenses are estimated at $4 million, meaning net savings are $11.75 million.

SOURCE: BEAR, STEARNS, NEW YORK

Bear, Stearns puts stock into net testing

Hanging on a wall behind the desk of Agile Networks, Inc. founder and Chief Executive Officer Bill Seifert is the company's first ever ATMizer switch order — from Bear, Stearns & Company, Inc.

"We went through a lot to get that order," Seifert says. "Bear, Stearns is more knowledgeable than many other buyers and has more concrete ideas about the behavior they want from the equipment. And they're a lot more skeptical of vendor claims."

In fact, the ATMizer is based in part on feedback from Bear, Stearns' Communications Technology Group (CTG) engineers concerning what features they needed in a virtual LAN switch.

"In many cases, we have to deploy technologies that really haven't been invented yet — we have to push them," says Jeff Marshall, senior managing director of CTG. "Often, there is nothing else to do but experiment in the production environment."

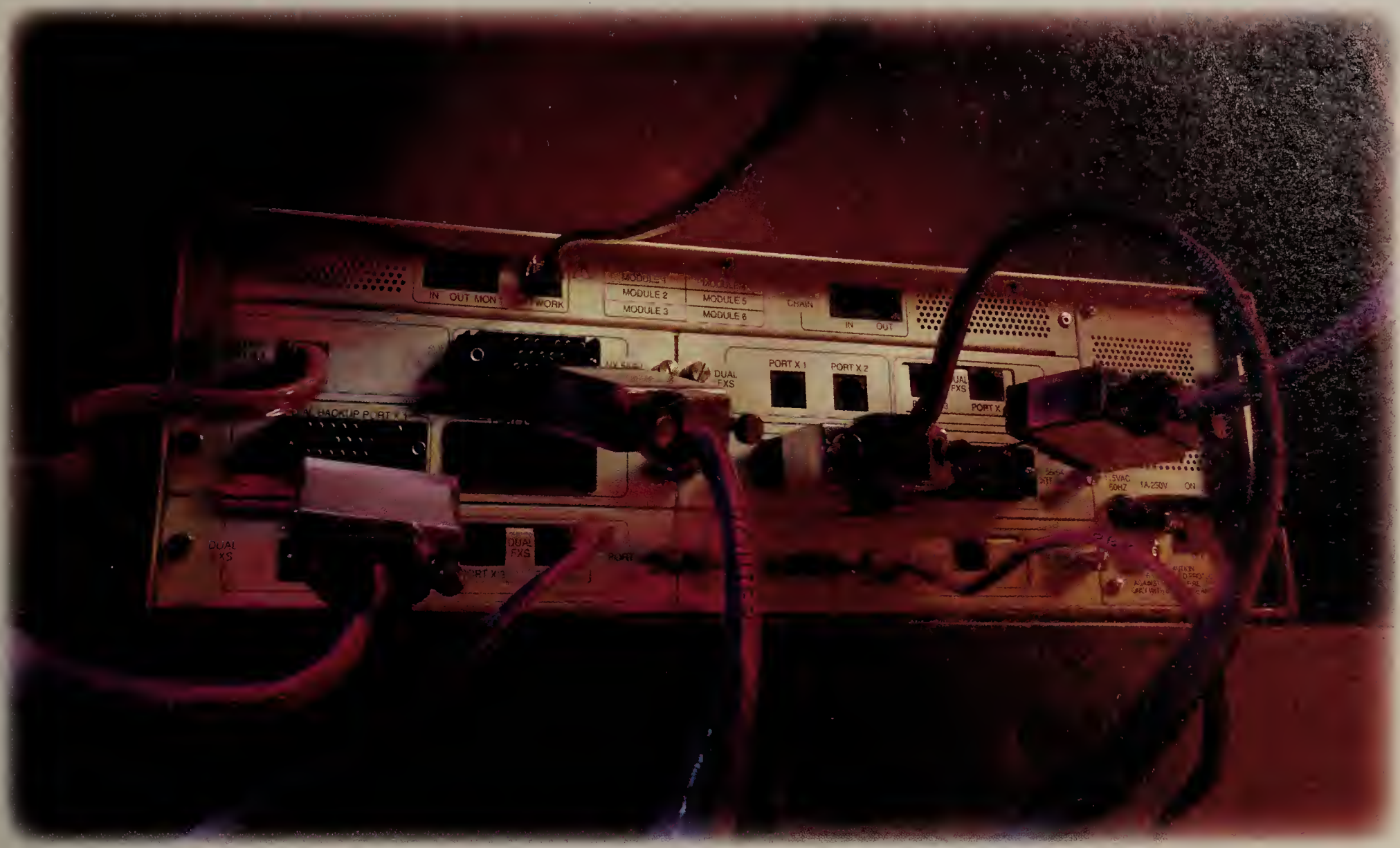
That puts the company on the bleeding-edge of new technology. But there's a price to pay: CTG is always in learning mode. And when it comes to ATM and VLANs, the group has learned a lot.

The most important thing is to conduct up-front testing, says Don Henderson, associate director of new technology, network engineering and implementation within CTG. "You can't underestimate the amount of testing you have to do to verify that products work as advertised."

CTG also tested how network applications would fare in the new environment — basically by taking snapshots of real-time scenarios on the production network and then recreating those conditions in the lab to see how ATM and VLAN switches would change performance. CTG even simulated real-time outages, pulling cards or cables from devices and watching the test network reroute around failed links or switches.

"Don't take anyone's word about any products," Henderson says. "Always do the testing."

— *Charles Bruno*



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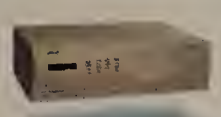

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POWER PLANNING:
What weighs on users' minds?

Survey says ATM will be big on campus while intranets bloom all over and frame relay rules the WAN.

By Paul Desmond

If you haven't got your Internet and intranet act together, if you're not using frame relay in a big way, and if you haven't at least put together a trial of ATM on the campus, you need to get your planning act together because you're behind the curve.

That message comes through loud and clear from the 1996 Network World/Deloitte & Touche Consulting Group Technology Planning Survey. The survey is based on in-depth interviews with strategic network planners at 41 organizations with annual revenue of at least $500 million — that means high-profile names such as Ryder System, Inc., The Travelers Insurance Co., Phillips Petroleum Co. and CSX Corp. Additionally, senior networking consultants from Deloitte & Touche Consulting Group's networking practice participated in both designing and analyzing the survey.

The results show companies have definitive plans for making intranets pay off in terms of the bottom line and enhanced customer service. To a lesser extent, the same is true for the Internet. In 1997, 'Net-based electronic commerce will make strides, but may not realize its full potential because security remains a large stumbling block.

On the campus, ATM rules: Nearly 60% of respondents are already using it for campus backbones or have pilots in the works.

Out in the wide area, frame relay is king while private lines appear to be on the wane. Internationally, 1997 could be a big year for global carrier consortiums if they come through on their promises for seamless international nets.

There's far less concensus on network operating systems (NOS), with NetWare and Windows NT battling for user mind share. And in terms of net management, many respondents still bemoan the lack of quality integrated management tools, as well as design and simulation products. Even Web-based management tools failed to garner much enthusiasm. Tough crowd.

One respondent, who represents a major state agency, summed up the business driver behind various user plans as the need for "customer intimacy." End users inside an organization as well as customers outside the company "want to have access to their information instantly, and they want to have instant acknowledgment that the changes or updates they made have been recorded," the respondent says. "More importantly, our customers are looking for the ability to slice and dice their information themselves."

GIACOMO MARCHESI

'Net results

Intranets and the Internet will be key to making that happen, and survey respondents have some innovative plans in the works. Railroad giant CSX, for example, is "giving selected customers the ability to track their shipment on a car-by-car level, [by accessing] our systems through the Internet," says Tom Blady, assistant vice president of communications solutions for CSX in Jacksonville, Fla.

At Columbia University in New York, classroom walls will, in effect, come down in 1997 as the school streams video over its internal network and simulcasts classes over the Internet. Its Center for New Media has already begun to provide RealAudio recordings of all lecture series, so students can listen on demand via the Web; that effort will be expanded next year. "We are so dependent on the net that if it goes down for five minutes, there are lines of people knocking on our door," says Andrew Lih, director of technology at the Center for New Media.

By 1997, the U.S. Postal Service's (USPS) intranet will be the main transport mechanism for all transactions and data, says Donald Sautter, manager of network operations at the USPS's National Information Service in North Carolina. "We're moving off the old IBM SNA platform to the intranet," he says. "Ninety percent of that is already done, with the rest to be completed by the end of [1996.]"

Gerard Cunningham, a partner with Deloitte &

Catching up with you

How we conducted the survey.

It's no mean feat to catch up with 41 top-level executives from big companies and get them to spell out their technology plans.

That was a big lesson *Network World* learned from this year's technology planning survey, which was conducted by Market Data Group of Framingham, Mass., and sponsored by Deloitte & Touche Consulting Group.

Respondents were interviewed via telephone during a three-week period in October. To get through to the chosen 41, Suzanne Sudan, president of Market Data Group, estimates her company made 400 to 500 phone calls.

They were calls at all hours and to all points on the globe. Sudan says one respondent was in Budapest when she finally caught up with him. Several others called in from cellular phones — one even on a Saturday morning.

Then there were those who refused to take part. Fifteen companies said they couldn't participate due to company policy. Another 19 said their network plans were too strategic to discuss. Others would participate only if their public relations representative was also on the line. Balancing those were some who agreed to be interviewed even though they normally decline press requests for comment.

When all was said and done, several participants told Sudan they were glad to go through the process because the questions forced them to stop and think about the direction they were headed. We hope you can say the same after reading what they had to say.

– Paul Desmond

CHURCHILL & KLEHR

Touche Consulting Group, says the danger in all these intranet plans is that network IS folks get involved too late in the process, resulting in major application or nework redesigns once the network consequences are evaluated. "That happens more often than you'd expect," he says. Network IS should be involved from the conceptual stages of an intranet project.

There is generally a more cautious optimism regarding the Internet, given security concerns, but count the City of Chicago among the optimists. "We plan to put city information on the Internet," says Bernie Mandelman, director of IS for the city. "We will streamline the permit application process via the Internet all the way down to having terminals in libaries, public buildings, etc."

Likewise, home-shopping giant QVC, Inc. offers customers of its Internet-based Interactive QVC (IQVC) about 50,000 products. Bruce Lummis, vice president of telecommunications for the firm, says within five to eight years IQVC could be larger than the core television-based business.

Executives in other industries aren't as gung ho. National City Corp., a Cleveland-based bank, intends to conduct business over the Internet, but is mindful of the security risks. "The world's best hackers are on the Internet, and they are looking for deep pockets," says Dick Bradner, vice president of computing and communications, as well as director of network communications for the firm.

Partners Health Care System in Boston, meanwhile, is even more cautious. "Partners will not be. . . sending information across the Internet until we are completely sure that security cannot be compromised," says Jim Marra, corporate director of technology planning.

ATM attacks the campus

On the other hand, lots of respondents will be sending information across ATM-based campus backbones in 1997. Respondents ranging from NationsBank Corp. to Phillips Petroleum either already have ATM campus backbones installed or are planning to set them up in '97. Most cite the need for ever-more bandwidth to support multimedia and other graphical applications.

But only one user — Bear, Stearns & Company, Inc. — says it will need ATM to the desktop in 1997. It is clearly ahead of the curve, having used ATM in its campus backbone for a number of years. (Bear, Stearns was also cowinner of *Network World*'s 12th Annual User Excellence Award competition. See story, page 80.)

Far more common are respondents like NavComm Corp., which says it may bring ATM to the desktop in 1998, or National City bank's Bradner who says, "We are looking at 1999/2000 for ATM to the desktop."

Second to ATM in terms of popularity is Fast Ethernet switching, which 41% of respondents plan to deploy or trial in 1997. Here again, only a handful note plans to extend the 100M bit/sec technology all the way to the desktop, with connections to servers and other backbone equipment far more common. Another 15% use FDDI as their campus backbone technology of choice.

Similarly, Gigabit Ethernet was named by only five respondents as a consideration for 1997, and three of those were skeptical because the technology is so new and standards have yet to be hashed out. One respondent also questioned how well it will scale.

SOLD ON OUTSOURCING

Seventy-five percent of respondents plan to use some form of outsourcing in 1997, mostly for tasks deemed nonstrategic. One organization, the U.S. Postal Service, will outsource all network operations.

Winning the WAN

There are few skeptics when it comes to frame relay. When asked what WAN services they planned to increase use of in 1997, more than 55% named frame relay. By contrast, only 7% of respondents said they plan to increase use of private lines.

"Frame relay has exploded, as has ISDN," says Philip Freyer, manager of domestic network architecture and design for United Parcel Service of America, Inc. (UPS) in Mahwah, N.J.

"It just doesn't make sense anymore to deal with private lines," Freyer adds.

"This is strictly an issue of price," agrees William Hooley, network manager for Electric Insurance Co. in Beverly, Mass. "Frame relay is cheaper."

Not everyone, however, is convinced of that. National City's Bradner says his evaluations have shown that frame relay could not oust his company's private T-1 net. "It is not cost-effective," he says. To make sure that's still the case, he's conducting more frame relay tests and price comparisons.

Most respondents aren't even at that stage yet when it comes to ATM in the wide area — although they have it on the radar. A few, including Marriott International, Inc., mentioned ATM as a natural stepping stone from their frame relay nets. "I see ATM as a possible step up in the wide-area network, and that is why we have positioned ourselves the way we have," says Barry Shuler, vice president of technology planning at Marriott. But he notes any shift to ATM is probably three to five years away.

Two more immediate challenges in the wide area are supporting an increasingly mobile workforce and building international nets.

Buddy Fiume, senior director of network services for Nabisco Food Group in Parsippany, N.J., puts it this way: "The question is, how do we deliver services and support to [users who are] increasingly working more from home, hotels, airports or even from store aisles?" The answer is to beef up the remote access infrastructure in a secure way.

The goal is to give salespeople access to inventory, pricing and promotional data that they can use to sell more products — and not just Nabisco products. There's an initiative under way called category management where retailers would look to a major supplier, such as Nabisco, to manage their whole cookie and cracker category. "This means our sales force needs accurate and current information not just on our own products, but even on our competitors' products," Fiume says.

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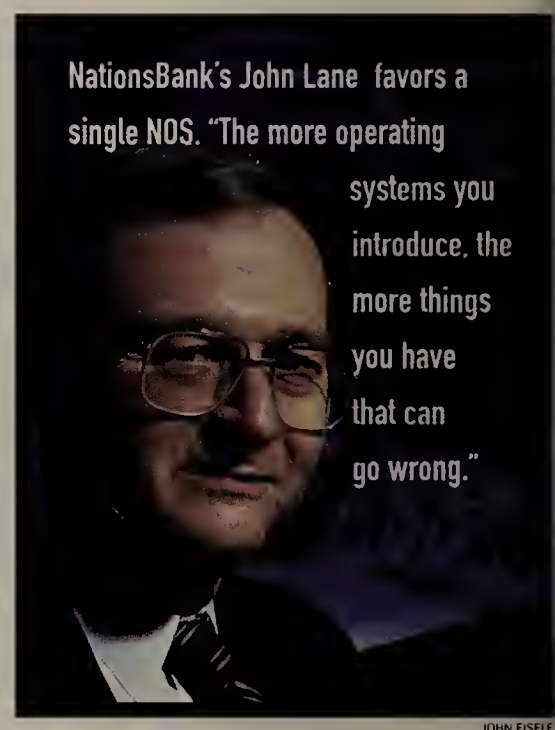
Such a challenge is more complicated when users are spread all over the globe. About 30% of respondents said expanding their international networks will loom large in 1997. Most of the growth in Marriott's lodging business, for example, is coming from overseas. "It's hard to get network capacity in some of these places for any price, and reliability is also an issue," Shuler says.

You don't have to tell that to Brian Rogers, corporate network designer and a team leader at Phillips Petroleum in Bartlesville, Okla. "In Norway, the carrier does maintenance on an unscheduled basis [without notice]," he says.

Respondents such as ABB, Information Management Services, Ryder System and First Data Corp. are all looking to carrier consortiums to help meet the international challenge. ABB has settled on AT&T Unisource to handle its international frame relay net, which will eventually reach at least 50 countries, says Bill Kernan, director of network services. It is also looking at a couple of carriers to manage its international voice network, he says.

There was widespread agreement among those surveyed that no one international carrier consortium could do it all. Deloitte & Touche Consulting Group's Cunningham calls that sound thinking. "Everyone is right to think of [international consortiums] as support vehicles to help them deal with global networking, but it's not the be-all, end-all answer at the moment," he says. "Those guys are likely to be the answer if they get their act together."

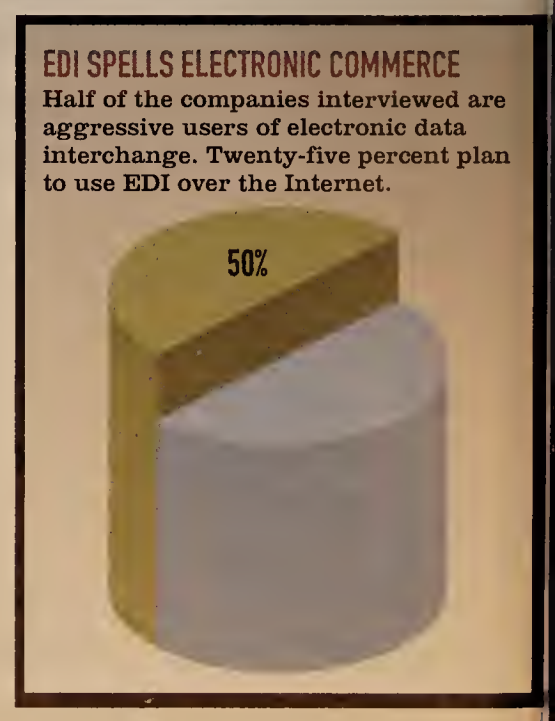


JOHN EISELE

NOS doings

Likewise, there's no be-all and end-all answer to the question of which NOS to use, or even whether you need to use only one. About 30% of respondents said they would standarize on a single NOS platform in 1997 — a roughly even split between NetWare and NT — but 60% said they would continue to use more than one.

John Lane, senior vice president of



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At one point the transition path looked clear. It seemed widely accepted that ATM would meet bandwidth demands and serve the local and wide area networks of the future. Now, the advent of fast LAN technologies such as switched Ethernet and token ring LANs, along with 100 Mb and soon, Gigabit Ethernet, challenges conventional wisdom. The picture is made more confusing by the existing FDDI technology and belatedly, cost-effective, standards-based ATM.

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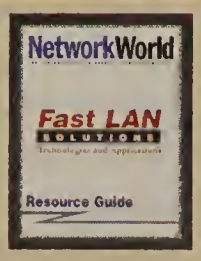

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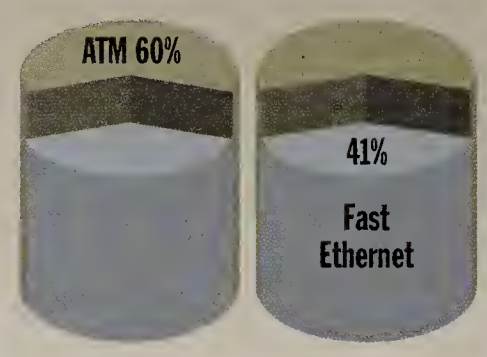
the information delivery group at NationsBank in Great Falls, Va., says standardizing on a single NOS is essential to maintaining synergy when offering a mix of products and services. "The more operating systems you introduce, the more things you have that can go wrong and the more pieces which have to talk to each other," he says.

Marriott's Shuler holds the opposing view. His company increasingly uses NT as an application server but continues to employ NetWare as its core NOS for file and print. "If NT becomes more robust in networking, we could possibly switch. However, I see coexistence for the foreseeable future," he says.

Another option, which only 10% of respondents said they would pursue in '97, is to use individual services from different NOSes. "If Novell continues to unbundle, we might see a time where we would go with NT and use Novell's directory services, for example," Shuler says. "We are monitoring all of this carefully."

CRANKING UP CAMPUS SPEED

Nearly 60% of respondents are either already using ATM for campus backbones or are testing it. About 41% say the same about Fast Ethernet. Some are using both. Only three companies say they have no plans to implement high-speed LAN technology in 1997.



Net management

Respondents are also monitoring their networks carefully, or at least trying to. But when it comes to network and systems management, responses to this year's survey are essentially interchangeable with those from any survey in the past five years or so. Most are still searching for tools that will give them truly integrated management.

"I've been shocked at the degree of naivete that I found on the part of some providers of systems management tools in terms of what they mean by systems management," says Nabisco's Fiume. "My view of systems management is bringing [data] together across platforms to do configuration management, network management, security, change control, operations and the functions that are necessary to keep all our systems going."

Indeed, users have raised the bar in comparison with years past in terms of what they're after. "It's no longer good enough to just understand the telecommunications and network side," says Ed Koch, vice president of telecommunications at First Data. "You now must know what the application is doing."

Users so far aren't enamored with the idea of the Web helping them solve such problems. A number of respondents noted that a browser-based interface will make it easier to extract data from various management applications, and Bear, Stearns said it was looking to integrate 19 element management systems using Web technology. But most respondents remain largely pessimistic.

"It is still not clear to me if the vendor coalition that is pushing Web-based standards will achieve critical mass," says Partners Health Care's Marra. "We have real and immediate needs, and we don't see immediate products."

Others say the Web will at least play a role in disseminating management information. "The network is still a mystery to everyone except the networking people," says John Osterman, director of network technologies at BankBoston. "We want to get information out to alleviate some of the mystery. The browser will be the presentation service."

Good network management starts with good network design, and users say they are looking for sophisticated design and simulation tools, largely to no avail. "There aren't a lot of design/simulation tools around," says Lance Boxer, chief information officer for MCI Communications Corp. in Atlanta. "We're working with [vendor] companies and internally to build some."

"We are very anxious about the next step in simulation tools," says Randy Lawson, research engineer at OSF Healthcare System in Peoria, Ill. "We want the ability to pull real-world data in to the simulation so it's more applicable and accurate."

Andy Daecher, senior manager at Deloitte & Touche Consulting Group, says there are tools on the market from vendors such as CACI Products Co., Make Systems, Inc. and Optimal Networks, but many tend to be expensive, running about $50,000. "A number of start-ups are trying to simplify this process and get the price down," he says. "But they run the risk of not having the level of complexity needed to handle all the protocols used in corporate networks."

KATHERINE LAMBERT

If there's a single message that experts at Deloitte & Touche Consulting Group take from the survey, it's the need to consider the network earlier in the application planning process. "We've been working with clients to help them improve the network/IT planning process by including the network as part of the application development life cycle," as opposed to tossing the application on the net and testing it after the fact, says David Lee, another senior manager at the firm. "Information flows and business processes need to be taken into account in application development. The same thing goes for the technology architecture and network planning process."■

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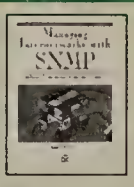

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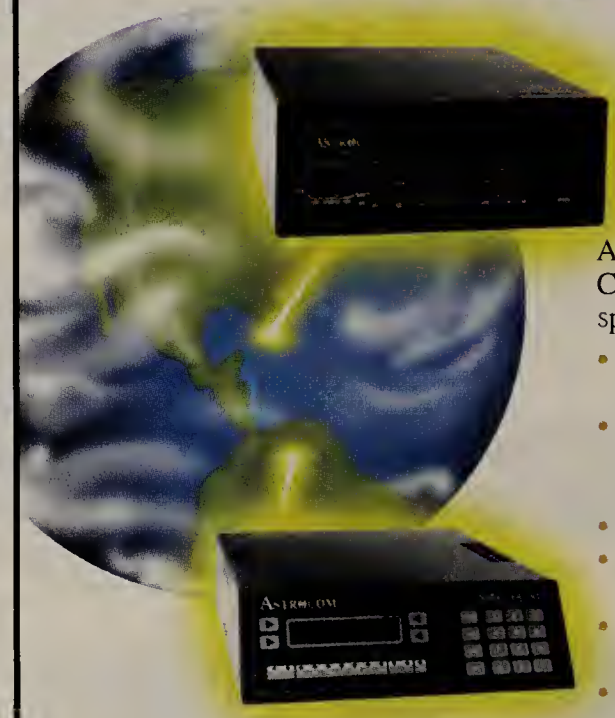

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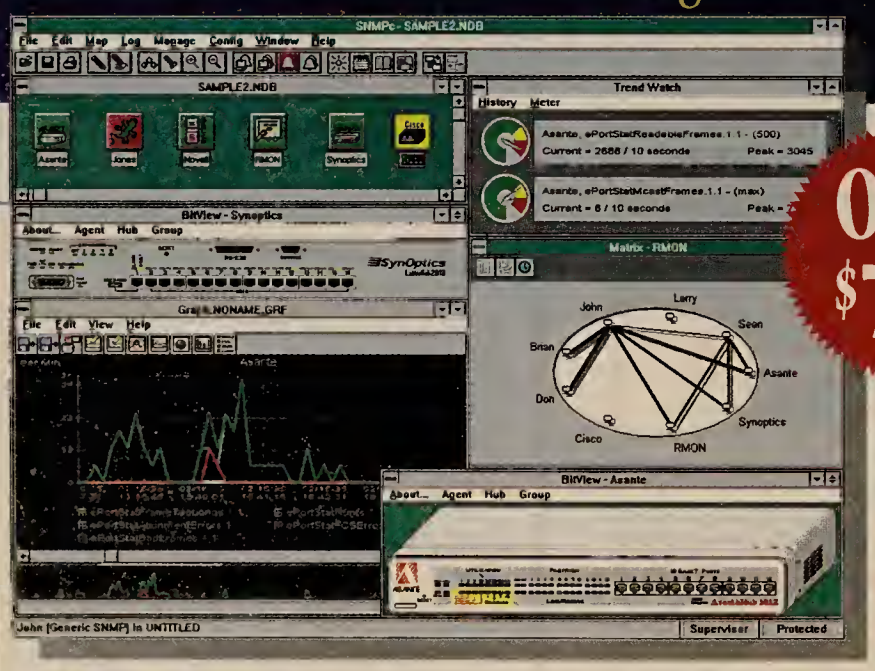

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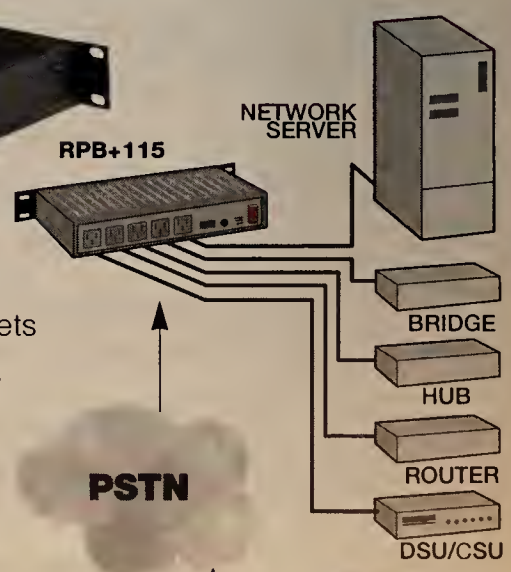

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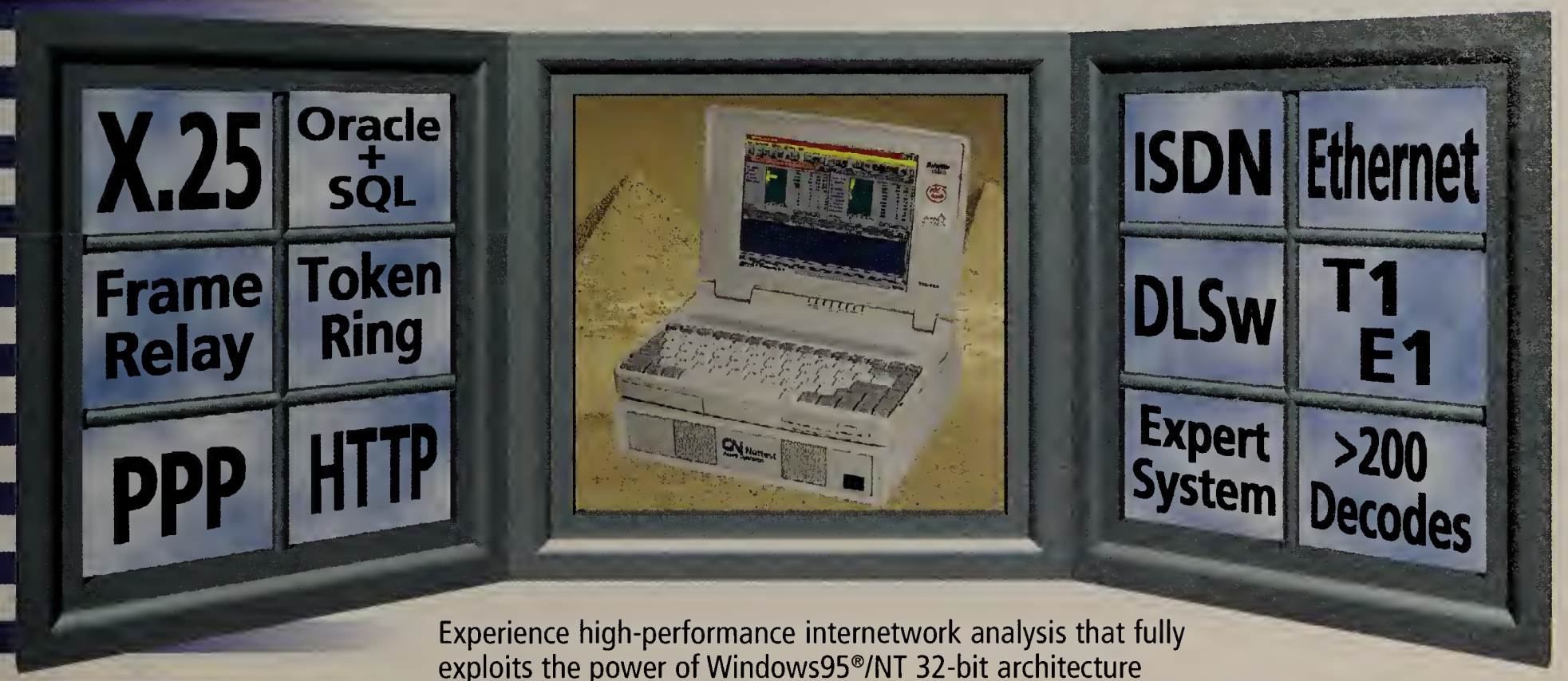

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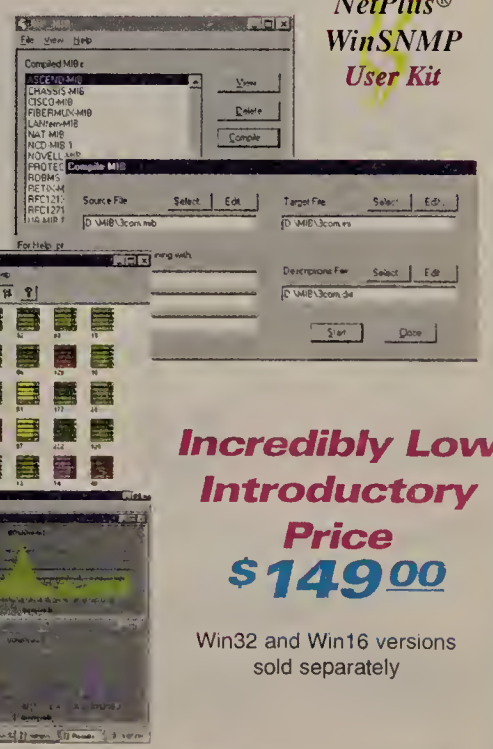

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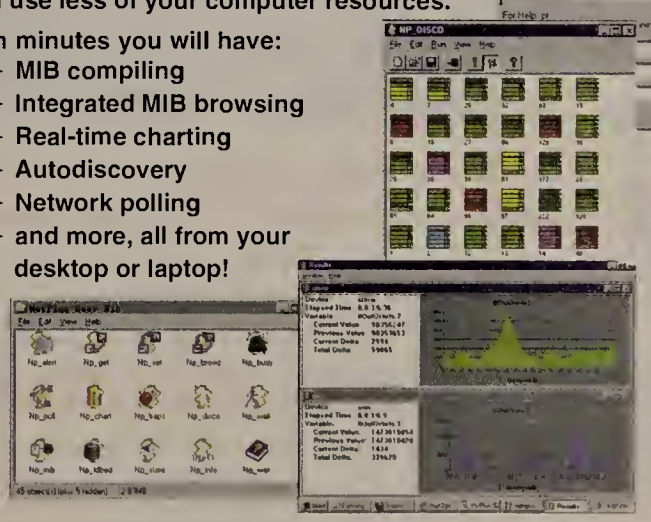

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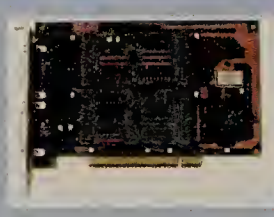

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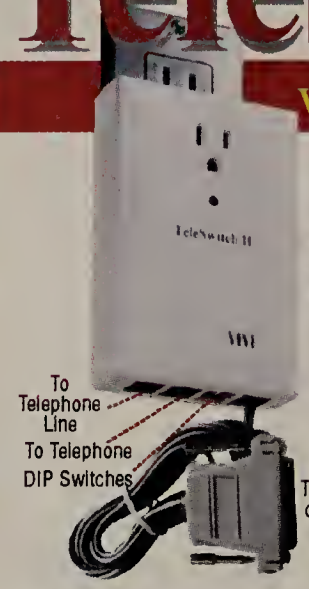

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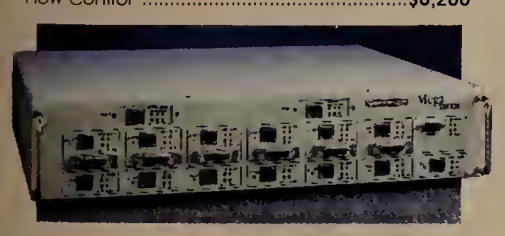

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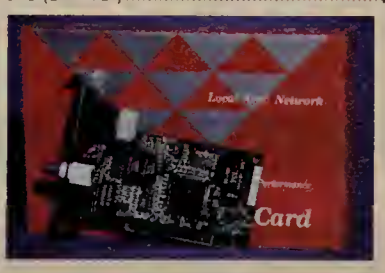

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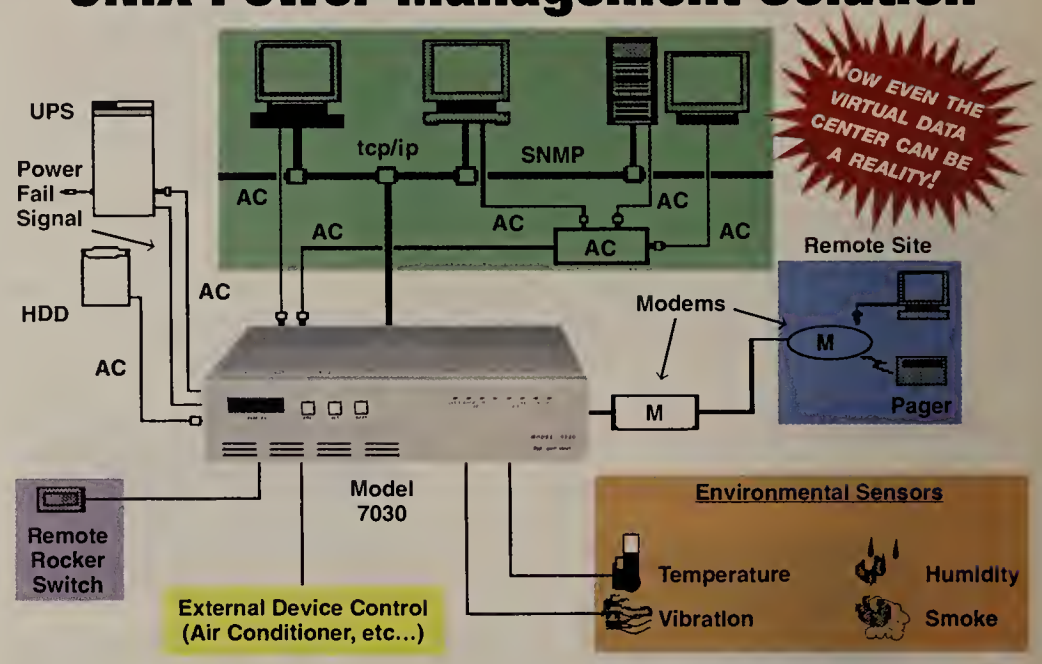

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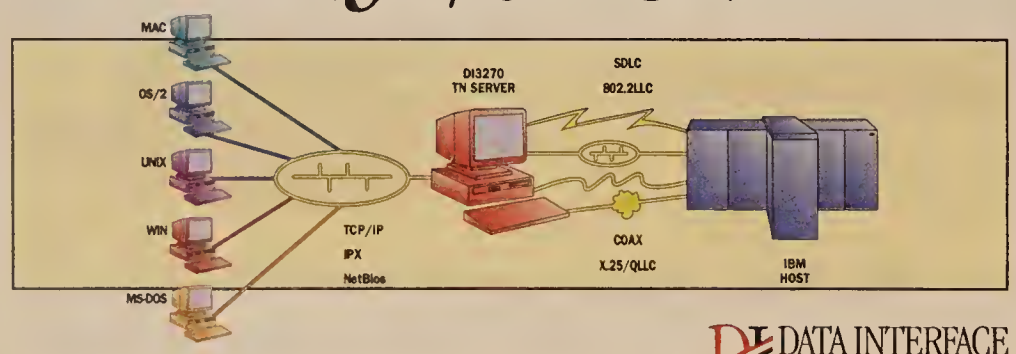

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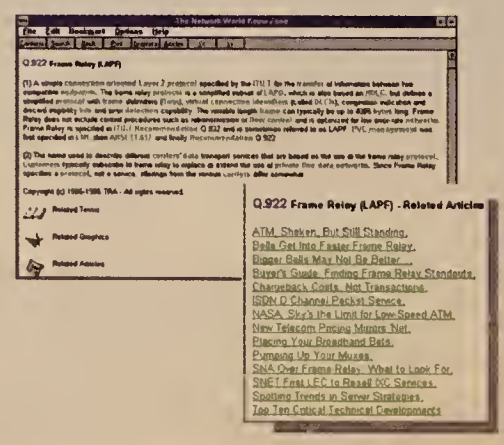

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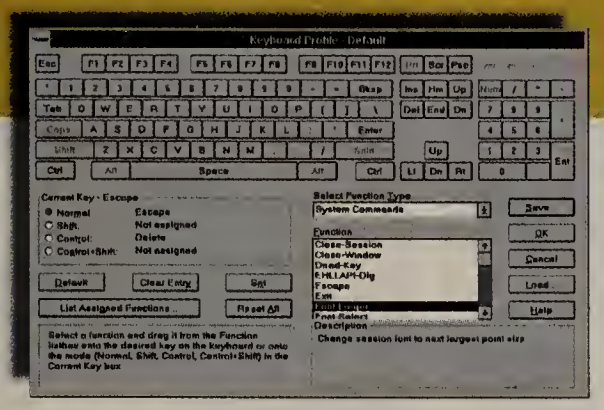

Highlights:

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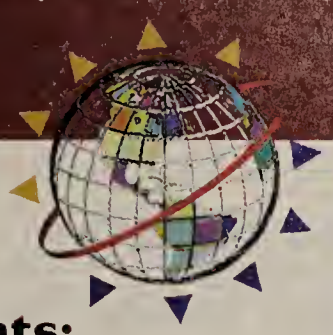

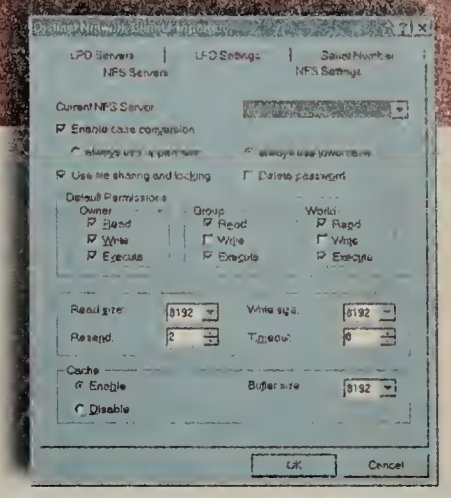

Highlights:

- Integrates seamlessly into Windows 95
- Mounts NFS drives from Explorer or Network Neighborhood
- Supports file and record locking
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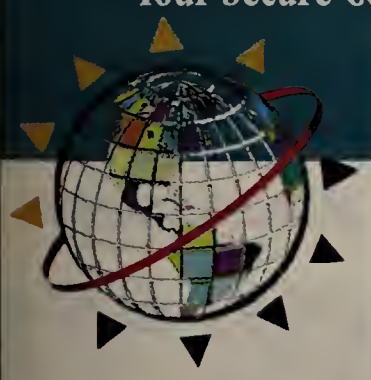

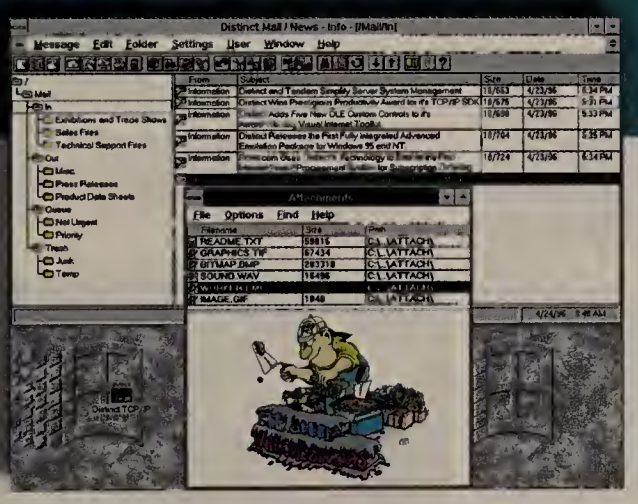

Highlights:

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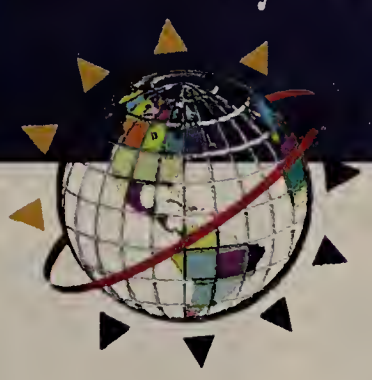

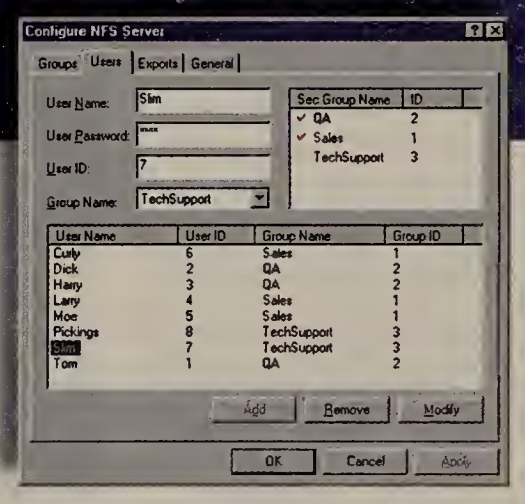

Highlights:

- Includes all major TCP/IP based file and printer servers in a single package: NFS Server, FTP Server, LPD, TFTP and BOOTP.
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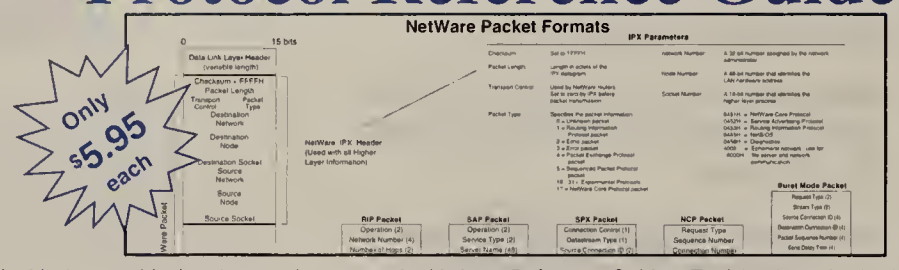

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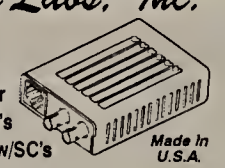

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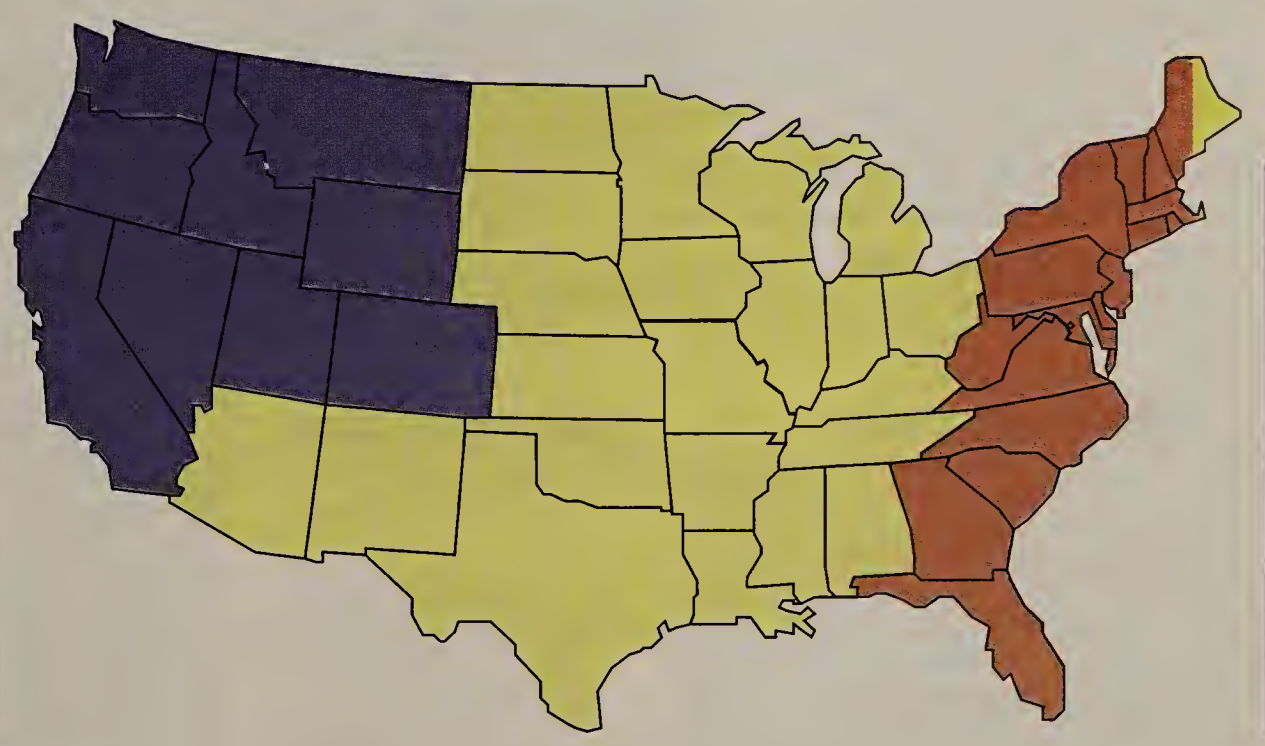

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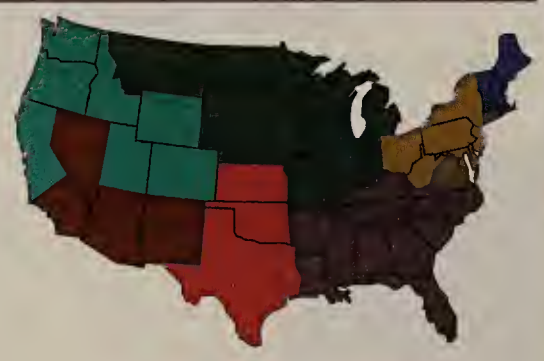

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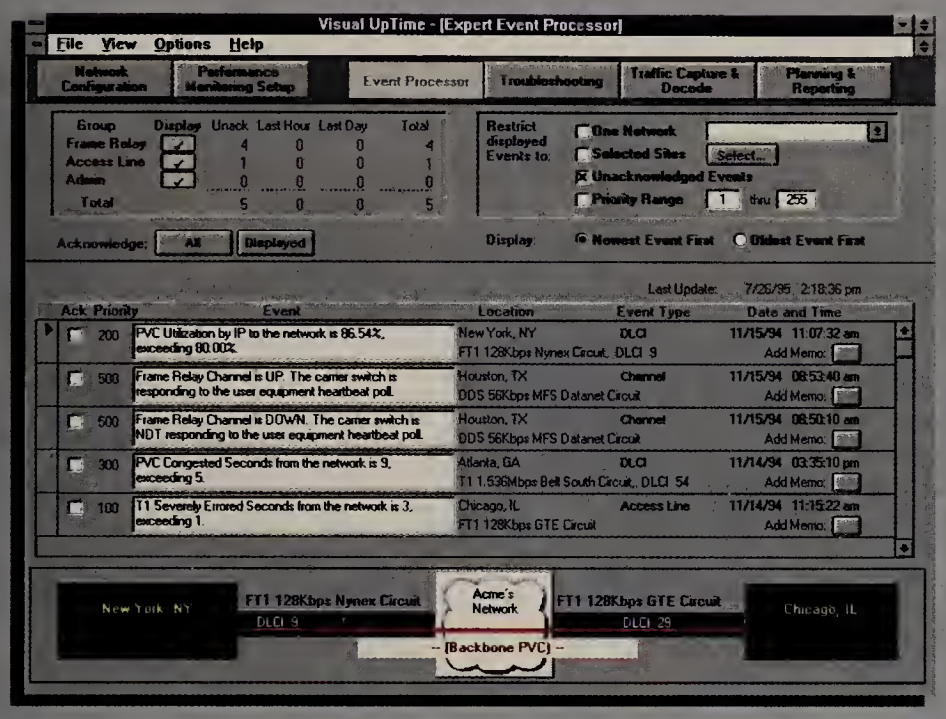

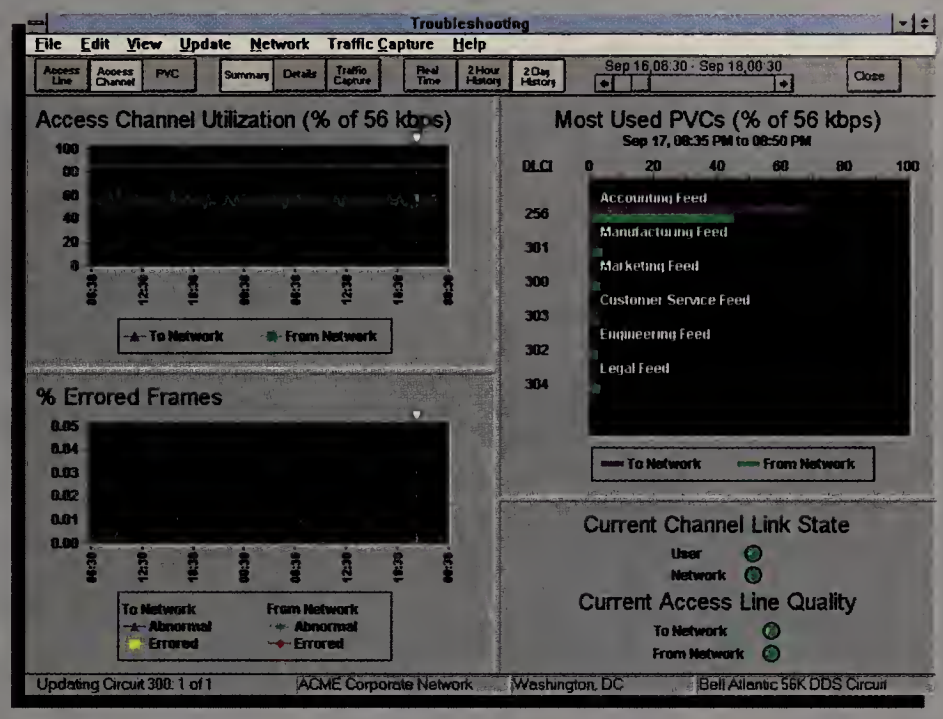

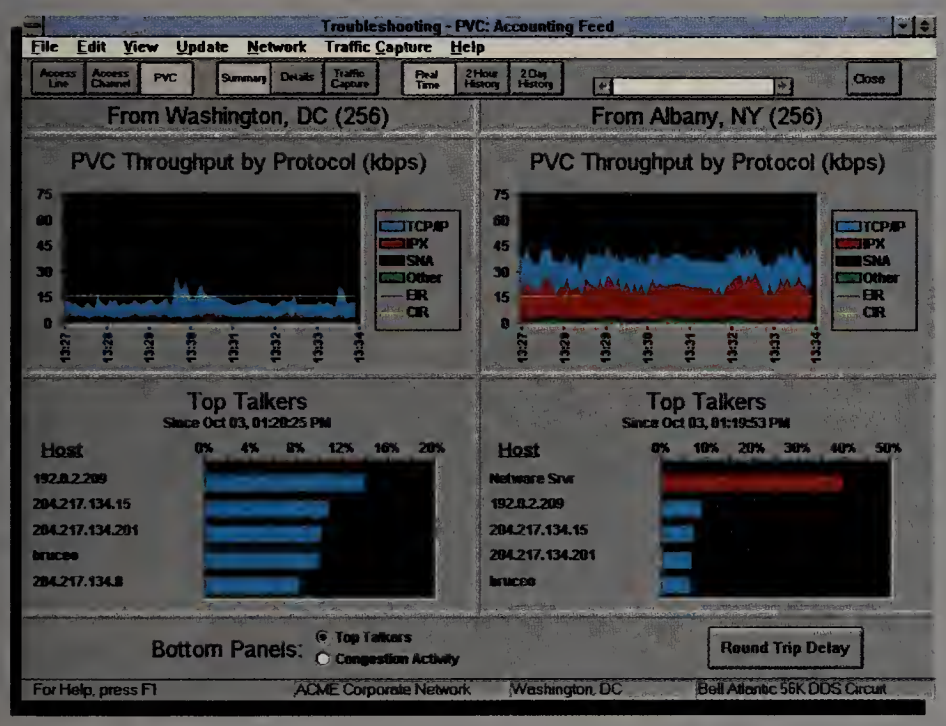

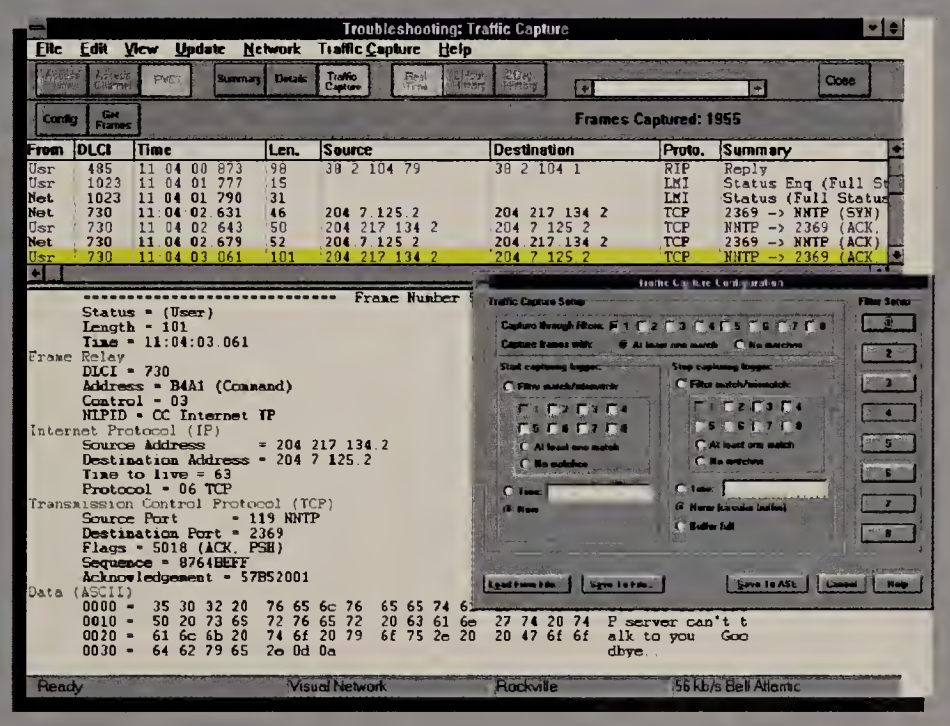

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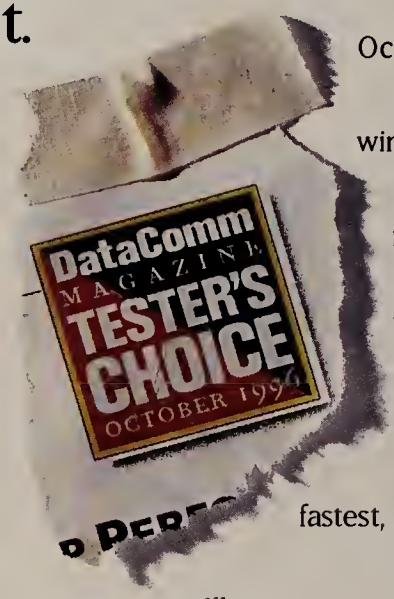

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